# Draft

# PBT National Action Plan

# For the Level 1 Pesticides

## Public Review Draft

Prepared by

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Toxic Pollutants (PBT) Pesticides Work Group

August 24, 2000

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## EXECUTIVE SUMMARY

On November 16, 1998, the U.S. Environmental Protection Agency (EPA) released its Agency-wide Multimedia Strategy for Priority Persistent, Bioaccumulative, and Toxic (PBT) Pollutants (PBT Strategy). The goal of the PBT Strategy is to identify and reduce risks to human health and the environment from current and future exposure to priority PBT pollutants. This document serves as the Draft National Action Plan for the Level 1 Pesticides, which includes six of the Level 1 priority PBT pollutants identified for initial action under the PBT Strategy: aldrin, dieldrin, chlordane, p,p-dichlorodiphenyltrichloroethane (DDT), mirex, and toxaphene.

Aldrin, dieldrin, chlordane, DDT, mirex, and toxaphene are all highly chlorinated, persistent organic pesticides that were once widely used in large quantities in the United States. They were used for a variety of applications, including: insect control on agricultural crops and cotton, treatment of livestock, control of ants, termite control in houses, and control of insect carriers of human diseases such as malaria. Because of evidence supporting the adverse environmental and human health effects of these substances, including their probable carcinogenicity, the pesticide uses of all of the Level 1 pesticides were canceled in the U.S. in the 1970's and 80's. In general, the remaining sources of Level 1 pesticides in the United States include:

- unused stocks of these canceled pesticides;
- contaminated reservoirs such as sediments, soil, and localized contaminated industrial and dealership sites;
- atmospheric transport and deposition (from both regional and international sources); and
- DDT present as an impurity (<0.1%) in Dicofol, a pesticide currently used in the U.S. and Canada. (Despite the presence of DDT as an impurity in Dicofol, current Dicofol usage data indicate that DDT releases to the environment from this source are likely to be small.)

Human exposure to the Level 1 pesticides occurs mainly through the food chain, and for the most exposed populations, is probably due to the consumption of contaminated fish. Potential risk and health consequences due to the Level 1 pesticides are of particular concern for certain human populations who have increased exposure (e.g., subsistence fishers) and/or increased susceptibility (e.g., the developing embryo/fetus, nursing infants, and children).

The Agency's programmatic baseline for reducing risk of exposure to the Level 1 pesticides has historically focused on the control of product manufacture and use. In the U.S., the manufacture and distribution of all the Level 1 pesticides has been prohibited, registered pesticide uses have been canceled, and food tolerances revoked. Voluntary pesticides collection programs, which are primarily maintained by states and other non-EPA entities to collect unused stocks of waste pesticides, are also currently important mechanisms for reducing potential risk associated with the Level 1 pesticides.

Although uses of the Level 1 pesticides have been canceled, production facilities have been closed, and intentional releases have been effectively controlled, current research indicates that human and ecological health risk still exists from exposure to Level 1 pesticides. Data gathered in current multi-media monitoring efforts provide substantial evidence that the Level 1 pesticides are still ubiquitous in the environment, and at concentrations that may be of concern for both humans and wildlife. In addition, available information suggests that significant quantities of unused, obsolete pesticide stocks may be stored throughout the U.S. and overseas, which would have the potential to cause serious environmental contamination and human health risk if they were accidentally released or not disposed of properly. Therefore, to address these remaining risks, the Agency will focus on:

1. Preventing accidental releases by facilitating, encouraging, and supporting programs to collect and properly dispose of unwanted pesticides;

2. Facilitating, to the extent possible, the remediation or containment of non-point and reservoir sources including sediments, contaminated industrial sites, agricultural chemical dealer/storage sites, and past use sites on a priority basis.

3. Reducing human exposure through public education, fish advisories, and other outreach;

4. Working internationally to reduce or phase-out production and use of these substances, and to encourage environmentally sound management, disposal and/or destruction of stockpiles of these chemicals in other countries, with the goal of elimination of the risks from long-range transport; and

5. Continued monitoring of the Level 1 pesticides in all relevant environmental media, fish and wildlife, and humans with the goal to provide information regarding continued and emerging problems and to serve as the basis for measuring progress.

Agency activities to support states, tribes, and local governments in their pesticide collection programs will include continuing to supply technical assistance, helping to resolve regulatory issues and barriers, helping identify options for financing Clean Sweep programs, supporting program outreach, and facilitating the collection of pesticides from households and urban businesses.

The Agency's specific strategy for addressing reservoir sources and for monitoring environmental pollutants will not be limited to a focus only on the Level 1 pesticides. Rather, it will be part of broader Agency and other federal efforts, including: the Agency-wide contaminated sediment management strategy, the Agency's Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) programs, ongoing monitoring efforts, and Agency research on the sources and pathways of human exposure to toxic pollutants.

Recognizing that the consumption of contaminated fish is currently considered a primary route of human exposure, the Agency will continue to promote exposure reduction through public outreach with a focus on fish consumption advisories. This will include: working with state, federal, and tribal agencies to ensure adoption of consistent methods for developing and communicating fish consumption advisories, working with the Agency for Toxic Substances and Disease Registry on the development of outreach materials, and maintaining the National Listing of Fish and Wildlife Advisories.

The Agency will also continue to work on and coordinate with multiple international efforts including: 1) the United Nations Environment Programme Prior Informed Consent Procedure, Obsolete Pesticides Program, and Global Persistent Organic Pollutants treaty; 2) the United Nations Economic Commission for Europe Convention on Long-Range Transboundary Air Pollution (LRTAP); 3) the North American Commission for Environmental Cooperation Sound Management of Chemicals Program, and Regional Action Plans for Chlordane and DDT; 4) the North American Free Trade Agreement Technical Working Group on Pesticides; and 5) the World Health Organization's DDT phase-out activities as part of the Rollback Malaria Program; and 6) the Great Lakes Binational Toxics Strategy.

EPA considers stakeholder involvement essential to reaching the goals of the PBT Strategy. EPA will seek stakeholder input and invite comment on this draft national plan, as well as encourage all interested partners to join in implementing the key actions contained in this plan to reduce risks to human health and the environment from exposure to Level 1 pesticides. EPA is announcing the availability of this action plan in the Federal Register. Additional details on the Federal Register schedule are available at the PBT internet site: www.epa.gov/opptintr/pbt/. The Agency is soliciting public comment and information or data on the following topics and issues related to the PBT pesticides (Level 1):

- quantities of domestic unused stocks of pesticide products;
- historical trends or current soil residue levels (urban and agricultural);
- information on sites with significant Level 1 pesticide contamination that have not been identified in Appendix D;
- current indoor levels of pesticides used in residences;
- alternative disposal and soil/sediment remediation methods, and performance information;
- other sensitive or highly exposed human subpopulations;
- meaningful and feasible ways to address the problem of canceled pesticides in the environment;
- meaningful PBT goals, performance measures, and time frames for such accomplishments.

## 1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) created the Persistent, Bioaccumulative and Toxic (PBT) Chemical Initiative and developed an agency-wide PBT strategy to address the remaining challenges of priority PBT pollutants in the environment. These pollutants pose risks because they are toxic, persist in ecosystems, and accumulate in fish and up the food chain. The challenges remaining for PBT pollutants stem from the fact that many of them tend to be transported long distances in the air, transfer rather easily among air, water, and land, linger for generations, and span boundaries of programs and geography, making EPA's traditional single-statute approaches less than the full solution to reducing risks from PBTs. Due to a number of adverse health and ecological effects linked to PBT pollutants, and the fact that fetuses and children are especially vulnerable to health damage from PBT pollutants present in the food supply and the environment, EPA must aim for further reductions in PBT risks. To achieve further reductions, a multimedia approach is necessary. Accordingly, through the PBT Strategy, EPA has committed to create an enduring cross-office system that would address the cross-media issues associated with priority PBT pollutants.

The goal of the PBT Strategy is to identify and reduce risks to human health and the environment from current and future exposure to priority PBT pollutants. To attain this goal, EPA has identified several guiding principles:

- Address problems on multimedia bases through integrated use of all Agency tools
- Coordinate with and build on relevant international efforts
- Coordinate with relevant Federal programs and agencies
- Stress cost-effectiveness (e.g., amount of PBT removed for dollar spent)
- Involve stakeholders
- Emphasize innovative technology and pollution prevention
- Protect vulnerable sub-populations
- Base decisions on sound science
- Use measurable objectives and assess performance

A key element of the PBT Strategy is developing and implementing national action plans for priority PBTs. These action plans are to draw upon the full array of EPA's statutory authorities and national programs, build on voluntary efforts under the Great Lakes Binational Toxics Strategy, and use regulatory action where voluntary efforts are insufficient. The action plans are to consider enforcement and compliance, international coordination, place-based remediation of existing PBT contamination, research, technology development and monitoring, community and sector-based projects, the use of outreach and public advisories, and opportunities to integrate efforts across chemicals.

This document serves as the Draft National Action Plan for Level 1 Pesticides, which includes six of the Level 1 priority PBT pollutants identified for initial action under the PBT Strategy: aldrin, dieldrin, chlordane, p,p-dichlorodiphenyltrichloroethane (DDT), mirex, and toxaphene. This draft action plan will first look at the environmental and human health baseline for the Level 1 pesticides and the strategic questions that arise from considering this baseline. The plan will then look at the existing programmatic baseline of how EPA has been addressing the Level 1 pesticides as an agency. Finally, the plan will outline proposed goals and actions specifically aimed at reducing risk associated with current and future exposure to Level 1 pesticides, but which will in some cases also aid in reducing human exposures to other priority PBT pollutants. In accordance with the goals of the overall PBT strategy, the actions have been evaluated in terms of their potential to effect reductions in Level 1 pesticides, as well as other PBT pollutants, from various sectors, and across all environmental media.

## 2.0 GENERAL DESCRIPTION OF THE LEVEL 1 PESTICIDES

Aldrin, dieldrin, chlordane, DDT, mirex, and toxaphene are all pesticides that were once widely used in large quantities in the U.S. for a variety of applications, including: insect control on agricultural crops and cotton, control of ants, termite control in houses, and treatment of livestock. Mirex was also used as a flame retardant. DDT was, and still is in many countries, used for control of insect carriers of diseases such as malaria and typhus. Past usage of these pesticides was large enough to cause significant environmental contamination during the years of their use. In general, the remaining sources of Level 1 pesticides in the United States include:

- unused stocks of Level 1 pesticide products;
- contaminated reservoirs such as sediments, soil, and localized contaminated industrial and dealership sites;
- atmospheric transport and deposition (from both regional and international sources); and
- DDT present as an impurity (<0.1%) in Dicofol, a pesticide currently used in the U.S. and Canada. (Despite the presence of DDT as an impurity in Dicofol, current Dicofol usage data indicate that DDT releases to the environment from this source are likely to be small.)

All of the Level 1 pesticides are highly chlorinated organic compounds, with five or more chlorine atoms per molecule. This high degree of chlorination makes these compounds degrade very slowly, and as a result, generally persistent in the environment. In soils, the Level 1 pesticides generally bind strongly to particles, and may remain in surface soils anywhere from a few months to many years.

Many of the Level 1 pesticides are known to volatilize from surface soils (e.g., dieldrin, chlordane, toxaphene), which may be a significant source of these substances to the atmosphere. In addition, volatilization of pesticides (most notably chlordane) from treated soils around homes may increase concentrations of these pesticides in indoor air. Pesticides associated with eroded particulate matter may also be suspended into the air by wind. Once in the atmosphere, pesticides have been known to travel long distances and have been detected in many remote locations, including the Arctic. The potential transport distance depends on the atmospheric residence time (an estimate of the partitioning, reaction and deposition rates of a particular chemical based on its chemical properties) and on whether the dominant removal pathway from the atmosphere is via deposition (e.g., instead of chemical reaction). Where such deposition is reversible, cycles of deposition and re-emissions can result in transport distances that far exceed expectations based on atmospheric residence time – known as the grasshopper effect.

The Level 1 pesticides reach surface waters primarily as runoff (pesticides associated with eroded soil particles) or via atmospheric transport and deposition. In aquatic systems, most of the Level 1 pesticides are not very soluble in water, and typically tend to accumulate in the solid phase (suspended particulate matter and bottom sediments) due to their tendency to bind to particles. The Level 1 pesticides may persist for years in aquatic sediments. As the Level 1 pesticides generally bind strongly to soil particles as well as sediment, concentrations in groundwater (due to leaching) and the dissolved phase in surface water are typically low. Concentrations of dieldrin in surface waters, however, have been observed to be higher than those of many of the other highly persistent organochlorine pesticides, primarily due to its greater preference for the water phase, relative to other compounds in this class.

In biota, the Level 1 pesticides tend to accumulate in biological tissues, especially the fatty tissues of fish and piscivorus (fish-eating) wildlife, such as marine mammals and predatory birds, as well as humans. As these substances are taken up by shellfish and fish from contaminated water and sediments, they tend to biomagnify (accumulate in increasing larger amounts) through the food chain. This bioaccumulation and biomagnification can result in high levels of the Level 1 pesticides in fish, aquatic mammals, and other fish-consuming species.

Because of evidence supporting the adverse environmental effects and human health effects, including the probable carcinogenicity of these substances, the pesticide uses of all of the Level 1 pesticides were canceled in the U.S. in the 1970's and 80's. The flame retardant uses of mirex were curtailed in the 1970's and replaced by more effective products. Production facilities have closed and manufacturing of all six Level 1 pesticides has ceased in the United States.

While domestic production has ceased and pesticide uses have been canceled, these pesticides continue to have an environmental presence, which is the combined result of the large quantities of these pesticides used in the 1960's and ‘70's and their inherent persistence. The detection of some of the Level 1 pesticides in remote locations where they were never used, indicates that atmospheric deposition from regional volatilization and long range sources may also be an important contributor to continued environmental presence in some areas. In addition, some of the Level 1 pesticides continue to be produced, used and/or improperly stored in other countries, potentially contributing to atmospheric transport and deposition. Although environmental concentrations of these pesticides have, with few exceptions, shown a general decline in most media over the years due to their cancellation in the U.S., current contamination levels remain a concern. This concern is reflected in water concentrations that exceed national water quality standards, sediment concentrations that exceed sediment guidelines, and recurring fish consumption advisories based on unacceptable levels of these pesticides in sport, subsistence and commercially harvested fish.

Appendix B contains more detailed information on the specific uses and sources, chemical properties, and environmental fate and transport of each of the Level 1 pesticides.

## 3.0 HUMAN HEALTH EFFECTS

Aldrin, dieldrin, chlordane, DDT, mirex, and toxaphene have all been linked to several adverse health effects in humans. Most knowledge of human health effects of the Level 1 pesticides is based upon poisoning episodes and background exposure, as well as occupational and animal studies.

The possible short-term health effects of the Level 1 pesticides include: neurological disruptions (e.g., headaches, dizziness, nausea, vomiting, irritability, confusion, ataxia, tremors, convulsions, and general malaise); and eye, nose, mouth and throat irritation. Large doses can cause death. Long-term health effects of the Level 1 pesticides can include: central nervous system damage and neurological system disruption; damage to the reproductive system; liver, kidney and thyroid damage; and damage to the digestive system. Some of these pesticides (e.g., chlordane) may also cause neurological and behavioral disorders in children who are exposed before birth or while being nursed, and may increase the chance of miscarriage. Many of these pesticides are suspected endocrine disruptors, and all are classified by EPA as probable human carcinogens based on sufficient evidence from animal studies.

Appendix B contains more detailed information on the specific human health impacts of each of the Level 1 pesticides.

## 4.0 HUMAN EXPOSURE

**The General Population.** Due to their stability, widespread historical use, and continued use overseas, small amounts of the Level 1 pesticides may be found in most outdoor and many indoor environments. While people may be directly exposed to these pesticides by inhaling pesticide-contaminated air (e.g., in homes previously treated with chlordane) or by coming into contact with or ingesting contaminated soil or water (e.g., as may occur from direct contact or proximity to highly contaminated land reservoir sources, such as hazardous waste sites and former pesticide mixing and loading sites), exposure via these routes is considered relatively infrequent. Rather, human exposure to the Level 1 pesticides occurs mainly through the food chain, and for the most exposed populations, is probably due to the consumption of contaminated fish. Elevated concentrations of many of the Level 1 pesticides (e.g., chlordane) have been the cause of fish consumption advisories in many water bodies.

As most of the Level 1 pesticides are fat-soluble, they also tend to accumulate in the fatty tissues and breast milk of humans and animals. For example, levels of DDT and metabolites were measured in the breast milk of 300 women in rural, suburban, and urban areas of Veracruz, Mexico in 1996 and 1997. Residues of p,p,'-DDE and p,p'-DDT were found in over 99 % of the samples. Calculated daily intakes of total DDT for breast-fed infants were estimated to be over twice the World Health Organizations acceptable daily intake for total DDT (20 $\mu$g/kg body weight/day) (Pardio et al., 1998). However, another study, using compiled and standardized data from 130 previous studies in order to review global trends in average levels of DDT in breast milk, documents a downward trend in DDT concentrations in breast milk since about 1970. For the U.S. and Canada, the data suggest an 11% to 21% per year reduction in average levels of DDT in breast milk since 1975. Together with similar reductions observed in other countries with restriction on DDT use, this analysis suggests that placing bans on persistent pollutants such as DDT can produce significant and measurable reductions in human body stores in fatty tissues after several years (Smith, 1999).

**Sensitive Populations and Geographic Areas**. Research has shown that the risk and potential health consequences due to Level 1 pesticide exposure are of particular concern in certain human populations who have increased exposure and/or increased susceptibility. Increased exposure levels are mainly an issue for certain subpopulations who consume fish and wildlife as a main staple of their diets, including: indigenous (e.g., Alaskan and Arctic) populations who subsist on fish, caribou, and marine mammals; culturally-oriented fishers; and low-income communities which may have a disproportionately high incidence of subsistence angling and hunting. Increased sensitivity or susceptibility to Level 1 pesticides exposure is of greatest concern for the developing embryo/fetus, nursing infants, and children.

Finally, because historical use of some of the Level 1 pesticides was higher in certain areas of the country, concentrations, and thus exposures, may also be increased in certain geographical locations. For example, because chlordane was primarily used to control termites, concentrations of the chemical are highest in the southeast portion of the country where termite infestations are a serious problem. In addition, populations living in certain areas of the country may have the potential for higher exposure to the Level 1 pesticides due to local fish consumption. Appendix B contains more detailed information on the specific human exposure routes for each of the Level 1 pesticides.

## 5.0 ENVIRONMENTAL BASELINE

### 5.1 SCOPE OF THE PROBLEM AND CURRENT STATUS AND TRENDS

While intentional use of the Level 1 pesticides in the U.S. has been largely controlled, concentrations of these substances in the environment, including food sources, remain a concern for both humans and wildlife. In addition, evidence suggests that there are still large quantities of obsolete waste pesticides stored throughout the United States. These unused stocks, if accidentally released to the environment, could potentially pose a non-trivial ecological and human health risk. In addition, the accumulation of obsolete stocks of some Level 1 pesticides in other countries is currently thought to be a large problem. Due to the potential for the Level 1 pesticides to undergo atmospheric transport and deposition, as well possible contamination of the worldwide food-chain (e.g., marine fish), these international waste stocks could also be contributing to environmental contamination and human exposure in the United States.

These long-canceled pesticides have been detected throughout various environmental media, including air, soil, water, sediments, and wildlife. As discussed in previous sections, most of the Level 1 pesticides ultimately tend to reside in the solid phase in soils or sediments, or to bioaccumulate in animals. Accumulations in soils and sediments, in turn, effectively function as long-term sources (reservoirs) re-releasing relatively small but constant quantities of the substances to water through runoff processes and sediment release, and to the atmosphere through volatilization.

Quantitative and qualitative data gathered in current multi-media monitoring efforts and discussion of issues regarding the quantities of unused Level 1 pesticide products remaining are detailed in Section 5.2 below.

## 5.2 QUANTITATIVE AND QUALITATIVE DATA ON CURRENT SOURCES AND RESERVOIRS

### 5.2.1 Level 1 Pesticide Products

Although no quantitative data are available on the magnitude of unused, uncollected Level 1 pesticide stocks remaining in the U.S., the following observations of the results of waste pesticide collection and disposal programs (commonly known as Clean Sweep programs) support the idea that there are large (but unquantified) amounts of pesticides remaining, which could pose a serious environmental and human health threat if released:

- Seven states account for about half of the 18 million pounds of all pesticides that have been collected by Clean Sweep programs through 1998 (with some 1999 data). Only sixteen states account for about 85 percent of this total.

- Minnesota, which has collected over 1.5 million pounds through a state-wide, well-organized program since 1990, found that 82 percent of their participants in 1998 were first-time participants.

- During the development of this action plan, outreach efforts with state officials consistently confirmed that states throughout the country believe that there are still significant quantities of unused Level 1 pesticide stocks in their respective states. However, absent requirements for reporting specific pesticides, many states can only provide qualitative estimates. Nonetheless, Level 1 pesticides have continued to be collected in certain Clean Sweep Programs, even after multiple collection events over several years in the same geographical areas. Clean Sweep program managers also consistently report that one of the biggest challenges they face is gaining the trust of the participants. Program coordinators have indicated that it may take several collection events in the same area before the less trusting participants come to an event.

- ! With the exception of toxaphene and mirex, the amounts of the Level 1 pesticides collected in the Clean Sweeps Programs (1990-1998) far exceeds the amounts currently estimated to be in the waters of the Great Lakes. Table 5-1 below shows estimates of the total amount of the Level 1 pesticides in each of the Great Lakes along with 1990-1998 estimates of the total amounts collected in Clean Sweeps Programs in the Great Lakes States. The amount collected for DDT+ metabolites was 27 times the amount estimated to be in the waters of all the Great Lakes combined. The amounts collected for aldrin/dieldrin and chlordane were approximately 2 and 10 times, respectively, the total Great Lakes loadings. It should also be noted that the estimated amount of pesticides collected most likely represents a conservative estimate of total amounts collected since data was not available for all years.

**Table 5-1. Comparison of Post 1990 Great Lakes Water Column Loads of Level 1 Pesticides to Masses Collected in Clean Sweeps**

| **Pesticides** | **Lake Superior** | **Lake Michigan** | **Lake Erie** | **Lake Huron** | **Lake Ontario** | **Estimated Total Pesticide Load in kgs** | |
|---|---|---|---|---|---|---|---|
| **Lake Volumes ($Km^3$)** | **12,100** | **4,920** | **484** | **3,540** | **1,640** | | |
| | Total Water Column Loading (kg) | Total Water Column Loading (kg) | Total Water Column Loading (kg) | Total Water Column Loading (kg) | Total Water Column Loading (kg) | Total Water Column Loading (kg) | Total Clean Sweep Collections in Great Lakes Basin (kg) [(a)] |
| **Aldrin + Dieldrin** | 1936 | -- | 368 | -- | 443 | 2747 | 5,772 |
| **Chlordane** | 133 | -- | 121 | -- | 426 | 680 | 7,888 |
| **DDT+ Metabolites** | 363 | 25 | 145 | 7 | 410 | 950 | 26,047 |
| **Mirex** | 121 | -- | 10 | -- | 115 | 246 | 0 |
| **Toxaphene** | 13,552 | 1,870 | 111 | 1,664 | 279 | 17,476 | 1,540 |

Source: USEPA, 2000. *BNS Great Lakes Pesticides Report*
[(a)] Clean sweep collections include all States in the Great Lakes Basin and represent total collections between 1990 through 1998. Based on reports and communications from states as of 11/16/98; compiled by Margaret L. Jones, U.S. EPA Region 5. Some data are estimates, and may be revised up or down with more complete analysis.

The information currently available regarding the Level 1 pesticides in other countries suggests that internationally, the problem of obsolete pesticide stocks is also large. For example, the Food and Agriculture Organization (FAO) of the United Nations estimated the quantities of obsolete stocks of aldrin, dieldrin, chlordane, and DDT in Africa and the near east in 1999 to total

20,631 kg (aldrin), 576,856 kg (dieldrin), 34,993 kg (chlordane), and 285,368 kg (DDT). Mirex and toxaphene were not listed in the 1999 FAO inventory. FAO also reports that, exacerbating the problem, many of these stocks are kept in substandard stores in deteriorating condition, and are often located in urban areas or near bodies of water such as rivers and irrigation water sources. This situation is often more serious in developing countries because there is typically little awareness of the inherent danger of pesticides, and because many of these countries have neither the capacity or facilities for disposal, nor the financial resources to handle problems related to obsolete pesticides (FAO, 2000).

### 5.2.2 Land / Soils

The Level 1 pesticides are found throughout U.S. soils. While, for the most part, the presence of the Level 1 pesticides in soils is diffuse and primarily due to past agricultural use for pest control on crops, there are some sites with heavy contamination. High concentrations of one or more of the Level 1 pesticides may be found in surface soils at former pesticide manufacturing and formulating facilities, storage facilities, pesticide retailers, and pesticide mix/load sites. Because the Level 1 pesticides generally bind strongly to soil particles, leaching of these substances from soils is minimal in most cases.

Each of the Level 1 pesticides has been identified at hazardous waste sites on the National Priorities List (NPL), which includes the most serious hazardous waste sites in the U.S. as identified by the Agency for long term federal cleanup activities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, also known as Superfund). According to the Superfund data base in December 1999, there were 1,227 sites on the Superfund National Priorities List (NPL). Although it should be noted that there is ongoing addition and removal of sites listed for a particular chemical and thus some of these statistics may currently vary, 380 of these sites reported pesticides as a contaminant. For many of these sites – including military facilities, landfills, most of the open dumps, and drum reconditioning facilities – pesticides were not listed as the primary toxic contaminant (i.e., the sites did not necessarily have heavy pesticide contamination). However, the following 55 facilities are identified as NPL sites where pesticides are a significant portion (or all) of the contamination (sites may have more than one chemical contaminant, and chemicals may be present in multiple media):

- 14 current or former pesticide manufacturing facilities;
- 20 current or former pesticide formulating facilities;
- 11 sites associated with wood preserving activities; and
- 10 other sites, including five disposal areas, a pesticide storage facility, a pesticide retailer, a grain storage area, an aerial applicator work area, and some mixing and loading sites.

Appendix C, Table 1 provides the location, site name and a brief description of these 55 sites. Appendix C, Table 2 provides a more detailed characterization of the fourteen present or former pesticide manufacturing sites. Although some of these NPL sites described are not specifically contaminated with Level 1 pesticides (e.g., some of the wood preserving facilities are primarily contaminated with pentachlorophenol or creosote), this comprehensive overview does help to characterize the extent of heavy pesticide contamination at certain sites in the United States.

Pesticide residues in soils have been assessed on a limited basis at several pesticide mixing and loading (mix/load) sites. For example, a study conducted of eighteen mix/load sites on farms in Florida found detectable levels of chlordane, DDT/DDD/DDE and toxaphene, in different combinations and at varying concentrations, present at 14 of the 18 sites sampled (Florida Department of Environmental Protection, 1996). In this study, three samples were taken from each site – a composite surface soil sample, a vertical composite soil sample up to a depth of 5 feet below land surface, and a water sample from deep irrigation wells at the sites. All of the samples were tested for a number of pesticides, including four of the Level 1 pesticides (aldrin, chlordane, DDT, and toxaphene). None of the Level 1 pesticides were detected in the water samples. Aldrin was not detected in any of the soil samples. The frequency of detects and ranges of concentrations for the Level 1 pesticides in soil samples is summarized in Table 5-2 below. At three of the 18 sites (17%) chlordane and toxaphene were found at concentrations that exceeded the Florida Department of Environmental Protection's guidelines for maximum acceptable soil concentrations based on human health risks associated with residential land use. Four other sites exceeded soil leaching criteria for at least one of the RCRA-regulated pesticides (chlordane, DDT/metabolites, or toxaphene). None of these Level 1 pesticides had recently been mixed, loaded, or used at these sites.

**Table 5-2. Summary of Soil Analysis Results at Florida Farm Mix/Load Sites**

| Pesticide | Number of Sites with Detect (out of 18) | Number of Surface Samples with Detect (out of 18) | Number of Depth Samples with Detect (out of 18) | Minimum Conc. (ppb) | Maximum Conc. (ppb) |
|---|---|---|---|---|---|
| chlordane | 8 | 7 | 4 | 4.7 K | 10,000 |
| DDD | 5 | 5 | 3 | 1.3 K | 830 |
| DDE | 9 | 9 | 7 | 0.93 K | 1200 J |
| DDT | 6 | 6 | 3 | 1.9 K | 250 |
| toxaphene | 6 | 5 | 6 | 42 | 540,000[1] |

Source: Florida Department of Environmental Protection, 1996
(K) The value reported is less than the minimum quantitation limit and is greater than or equal to the minimum detection limit.
(J) Estimated value, due to matrix interferences.
(1) Method detection limits elevated due to matrix interference.

Pesticide dealer sites have been studied in Illinois (Illinois Department of Agriculture, 1993). Table 5-3 below presents an estimate of the presence of Level 1 pesticides at 49 dealer sites. The study used four borings per site to a depth of 4.5 meters (15 feet) at targeted locations (loading areas, burn piles, wash areas, etc.) plus an additional sample at the site drainage-way.

Five of the Level 1 pesticides were among the 62 analytes tested, and all were found at least once; mirex was not included based upon rare usage in Illinois. However, leaching studies using the RCRA Toxicity Characteristic Leachate Procedure (TCLP) indicated that the RCRA hazardous waste rules would generally not apply. Hence, remediation would be based upon the major pesticides found, which are the corn and soybean herbicides atrazine, alachlor, metolachlor, etc. Land spreading of remediated soil would be at calculated rates below allowed label rates for the active ingredients present. From these results, an estimated 1,336 tons of soil per site would need to be removed and land spread on agricultural land. These 1,336 tons would carry with it some quantities of the Level 1 pesticides, as shown in Table 5-3. However, because these dealer sites will not be remediated all at once, the annual burden from land spreading would be small, allowing biological, chemical and other natural attenuation processes to assist in the disappearance of these substances.

Other potentially significant sources of direct exposure from contaminated land reservoirs are individual residences that have been treated with chlordane, aldrin, or dieldrin. Prior to their cancellation, organochlorine termiticides, particularly chlordane were used to treat many homes, soils, and building structures.. These reservoir sources have potential to be significant sources, particularly during demolition or other disturbances. In addition, a growing body of research has found a strong association between house dust and chlordane and other pesticide residues. Thus, an important urban source of chlordane, aldrin, and dieldrin exposure may also be the respiration of indoor air and house dust in previously treated structures, given that research has found levels in indoor air and dust to be as much as 10-100 times higher than in outdoor air and surface soil (Lewis et al., 1988; Whitmore et al., 1994; USEPA, 2000b).

### 5.2.3 Air

As discussed in section 2.0, all of the Level 1 pesticides can enter the atmosphere as a result of volatilization from surface soils at contaminated sites or where past use occurred, from surface waters via air-water exchange, from past and current international sources, and/or as pesticide contaminated eroded particulate matter that is suspended into the air by wind. In addition, there may be other specific practices, such as sediment drying from remediation activities, that may serve as important regional sources of pesticides to air.

Once in the air, the Level 1 pesticides (particularly mirex, DDT and toxaphene) may be subject to atmospheric transport, both regionally and over long distances, as estimated by Cohen, 1997, and documented by numerous researchers. For example, monitoring and modeling efforts during the 1980s (USDHHS, 1998), as well as the detection of high levels of toxaphene in the tissues of fish taken from a remote lake on Isle Royale in Lake Superior (De Vault et al., 1996), established the potential importance of atmospheric pathways for toxaphene inputs to regions in the upper latitudes, far removed from regions where it was heavily used as an agricultural pesticide. Other research, including back air-trajectory analyses for dieldrin, toxaphene and DDT conducted by the Integrated Atmospheric Deposition Network (IADN) in the Great Lakes region, has also demonstrated that airborne pesticides have the potential for long-range transport to and from the Great Lakes (IADN, 1998). Although much of the data available at this time regarding long-range transport of the Level 1 pesticides is for the Great Lakes region, it is not unlikely that similar patterns would be observed in other areas of the nation.

**Table 5-3.** **Level 1 Pesticides Found at Agrichemical Facilities in the Illinois Department of Agriculture / Illinois State Geological Survey Site Contamination Study - July 1993.**

| Pesticide[1] | Sites where Detected (Of 49 Sites) | | Samples where Detected (of 822) | | % of Specific Pesticide Detections found in Various Layers[2] & Drainage-way of Site[3] | | | | | Mean Conc. $\mu$g/Kg | Soil Screening Guidance Levels[4] $\mu$g/Kg | | Potential Quantities that might be land-spread for remediation in Illinois[5] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | %of 822 | % in A | % in B | % in C | % in D | % in Drain | | Natural Attenuation | No Attenuation | Av site Kg | Hi Est Kg | Lo Est Kg |
| Aldrin | 14 | 28.6 | 31 | 3.8 | 41.9 | 22.6 | 12.9 | 9.7 | 12.9 | 46 | 500 | 20 | 0.056 | 67 | 19 |
| Dieldrin | 34 | 69.4 | 94 | 11.4 | 55.3 | 23.4 | 5.3 | 2.1 | 13.8 | 75 | 4 | 0.2 | 0.09 | 109 | 76 |
| Chlordane | 18 | 36.7 | 47 | 5.7 | 70.2 | 17.0 | 6.4 | 2.1 | 4.2 | 855 | 10,000 | 500 | 1.04 | 1,243 | 456 |
| DDT | 15 | 30.6 | 37 | 4.5 | 51.4 | 29.7 | 8.1 | 2.7 | 8.1 | 11 | 32,000 | 2,000 | 0.013 | 16 | 5 |
| DDE | 12 | 24.5 | 25 | 3.0 | 28.0 | 52.0 | 4.0 | 0.0 | 16.0 | 22 | 54,000 | 3,000 | 0.027 | 32 | 8 |
| DDD | 7 | 14.3 | 11 | 1.3 | 9.1 | 63.6 | 9.1 | 0.0 | 18.2 | 8.6 | 16,000 | 800 | 0.01 | 13 | 2 |
| Toxaphene | 1 | 2.0 | 1 | 0.12 | | | | | | 1,743 | 31,000 | 2,000 | 2.11 | 2,535 | 52 |

Source: *Agricultural Facility Site Contamination Study.* Illinois Department of Agriculture, July, 1993. Per U.S. EPA Region 5 / D. P. Macarus / 11/30/99

1. Mirex was not one of 62 analytes tested.
2. 'A' layer is top gravel fill. ' B' layer is 0.5 meter below A. 'C' layer is next 0.5 meter. 'D' layer is from 4.0 to 4.5 meters in depth.
3. Soil surface (0-0.5 m) samples were collected from a prominent drainage way at the site
4. Superfund Guidance: EPA/540/R-95/128
5. These are boundary values. Site remediation would normally be based upon major contaminants, which in Illinois are the major corn & soybean herbicides: atrazine, alachlor, metolachlor, etc. However, the Level 1 pesticides would be carried along and land spread. These calculation estimate the quantities of Level 1 pesticides that might be spread over the years for the entire 1200 dealer sites. (Note, there are many ways to use the results - be careful how calculations are interpreted)

Av site: Kg of pesticide per site based upon 1,336 tons (2,000 lb tons) remediated per site and the geometric mean concentration at sites where detected only.

Hi Est: Assumes all 1200 sites will have average concentration, even sites with no-detects.

Lo Est: Assumes only fraction of sites with detects (column 3 above) will carry Level I pesticides at mean concentration.
Note: Remediation is generally only performed when real estate transfer or ground water contamination indicates a need.

From the atmosphere, the Level 1 pesticides may be deposited onto natural water bodies and surface soils through the processes of wet deposition, dry deposition, and gas exchange. Gaseous exchange of organic compounds at the air-water interface is known to be an important phenomenon in the balance of pollutants occurring in air and water (USEPA, 1997). Also, air-water and air-soil exchange can extend the cycle of deposition and re-emission of these compounds thus increasing the distance which they can travel by what is known as the "grasshopper effect". For example, before cancellation of the Level I pesticides and use reductions of other organochlorine chemicals, the relatively high pollutant concentrations in the atmosphere caused net absorption of pesticides to the Great Lakes at the water surfaces (USEPA, 2000). At present, however, for some pesticides, the Lakes are now a source to the atmosphere (IADN, 1998; Hillery et al., 1998). Using several years of IADN data, Hoff et al. (1996) estimated atmospheric loadings of dieldrin and DDT (+metabolites) for the five Great Lakes. Estimates of dieldrin and DDE showed a net loss from the lakes to the atmosphere via volatilization, while analysis suggested that p,p'-DDT is still being loaded into the lakes from the atmosphere.

Also of potential concern, particularly in terms of children's exposure to Level 1 pesticides, volatilization may also contribute to increased concentrations of some of the Level 1 pesticides in indoor air. Soils previously treated with termiticides such as chlordane are known to off-gas for many years. For example, as discussed in section 5.2.2 above, research has found levels in indoor air and dust to be as much as 10-100 times higher than in outdoor air and surface soil (Lewis et al., 1988; Whitmore et al., 1994; USEPA, 2000b).

### 5.2.4 Water and Sediments

Many of the nation's waters are contaminated with one or several of the Level 1 Pesticides. Section 303(d) of the Clean Water Act requires States to develop lists of impaired and threatened waters and submit them to EPA every two years. In the June 23, 1999 303(d) report, 12 States listed 98 water bodies or segments for chlordane; 6 states listed 98 water bodies or segments for DDT; 7 states listed 52 water bodies or segments for dieldrin; 4 states listed 27 water bodies or segments for toxaphene; 1 state listed 3 water bodies or segments for aldrin; and 1 state listed 4 water bodies or segments for mirex.

The 1998 National Sediment Quality Survey Report to Congress, which included sampling data collected from 1980 to 1983, reported DDT, chlordane, and dieldrin contamination at sediment sampling stations throughout the nation. For example, DDT was found at 803 out of 11,462 sampling stations (where DDT could be evaluated) at a level where adverse affects to either human health or the environment are probable. Although this sampling data likely has a bias towards contaminated areas, it provides an indication of the magnitude of pesticide contamination in sediments.

Data collected by the U.S. Geological Survey (USGS) National Water Quality Assessment Program (NAWQA) also show that DDT, chlordane, and dieldrin are still present at levels of concern in our nation's surface and ground waters, sediments, and fish ("The Quality of Our

Nation's Waters", USGS, 1999). DDT, dieldrin, and chlordane were all found to contaminate streams in both agricultural and urban areas, emphasizing the widespread distribution of pesticides in aquatic environments. Urban streams were observed to have the highest frequencies of occurrence of DDT, chlordane, and dieldrin in fish tissue and sediment, and the highest concentrations of chlordane and dieldrin. Pesticides were also observed in some ground water supplies. Although USGS data show dieldrin was found in ground water in only 1-2% of wells, exceedances of the USEPA Risk Specific Dose of 0.02 µg/l (corresponds to cancer risk of 1 in 100,000) occurred more often in some areas, such as metropolitan Atlanta, where 5 of 37 shallow wells exceeded the Risk Specific Dose. Although the wells were not drinking water sources, the results are indicative of the persistence of dieldrin and the potential for human exposure.

Under the Great Lakes Water Quality Agreement (GLWQA), the U.S. and Canada have identified forty-six highly polluted Areas of Concern (AOCs) within the Great Lakes. As shown in Table 5-4 below, some of the Level 1 pesticides have been designated as chemicals of concern (i.e., chemicals that contribute to impairment of beneficial use or the area's ability to support aquatic life) at several AOCs.

**Table 5-4. Great Lakes Areas of Concern (AOCs) with Pesticides Listed as Pollutants of Concern**

| State | AOC | Pollutant |
|---|---|---|
| New York | Buffalo River | Chlordane, DDT |
| | Niagara River | Mirex, Chlordane, DDT, DDE, dieldrin |
| | Oswego Lake | Mirex |
| | Rochester Embayment | Mirex, DDT, Chlordane |
| | St. Lawrence River/Massena | Mirex, DDT |
| Ohio | Black River | DDT |
| | Cuyahoga River | DDT |
| Wisconsin | Menominee River | Pesticides |
| | Milwaukee Estuary | Pesticides |

Source: USEPA, 1998. Access: www.epa.gov/glnpo/aoc.

Recent local case studies also demonstrate significant site-specific pesticide contamination of surface waters. For example, relatively high concentrations of several of the Level 1 pesticides, including chlordane, DDT, dieldrin and toxaphene have been found in Lake Apopka in Florida. Loss of surrounding wetland areas and heavy agricultural use has resulted in this lake's designation as the most polluted lake in Florida. The lake and surrounding habitat has also been the site of numerous bird deaths. Additional monitoring (as part of a criminal investigation) is ongoing to pinpoint a cause, or identify the source for the cause of the bird deaths in Lake Apopka.

### 5.2.5 Wildlife

Detectable quantities of the Level 1 pesticides have been found within a wide variety of animal species, and in some cases, at concentrations that have been known to pose serious risks to wildlife. For example, eggshell thinning as a result of DDT contamination (and biomagnification in the food chain) resulted in the Bald eagle, the Peregrine falcon, and the Brown pelican being among the first species to be listed as endangered or threatened under the Endangered Species Act of 1973 (ESA). Recent research has shown that pesticides such as DDT and its metabolites may be associated with low reproduction of nesting bald eagles even in remote, seemingly pristine environments (Anthony et al., 1999). In this study, conducted on the islands of the Aleutian Archipelago in Alaska, the researchers suggested that even though the contaminants affecting the bald eagles could have entered the food chain from local sources, such as possible undocumented use of DDT by the military, evidence indicates that they may well have arrived in the Aleutians from more distant sources. In fact, concentrations of organochlorine contaminants increased in eagle eggs from east to west along the Aleutian Island chain, which the researchers also suggest is a possible indication that Asia may be one potential source of the pollutants. Transport to the Aleutian Archipelago was also hypothesized to possibly occur biologically in the fat layers of migratory seabirds that nest at the Aleutians by the tens of millions.

Additional incidents of ongoing organochlorine pesticide poisoning in wildlife have been documented by the New York State Wildlife Pathology Unit (NYSDEC, 1997). In the 1996/1997 Annual Report, 21 poisoning deaths of birds were conclusively determined, based on autopsy and tissue analysis, to be due to one or more of the canceled pesticides chlordane, dieldrin, and DDT. This number was nearly twice that confirmed in the 1995/1996 Wildlife mortality report. Most of the incidents involved hawks, owls, and corvids (crows and jays). Although it was difficult in some cases to definitively link local contamination with mortality, a substantial portion of the pesticides were believed to originate locally from orchard and turfgrass areas that had received heavy historic pesticide application for grub and other invertebrate control. It was also hypothesized that some of the contaminants could have been picked up by the birds in their nesting or wintering grounds. The researchers in the Wildlife Pathology Unit suggested that because most or all of the pesticide poisoning incidents were related to historic use and persistence, and because most turfgrass areas contaminated with chlordane and dieldrin in New York state and other areas of the northeast remain unidentified, solutions to this sort of wildlife mortality may not be quickly or easily obtained.

The National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch Project has documented the presence of the Level 1 pesticides in the tissues of mussels and oysters in the nation's Great Lakes, and estuarine and marine waters. Chlordane, DDT, and dieldrin were detected in mussels and oysters collected at all 186 sites (intended to represent large areas rather than "hot spots') that were sampled annually between 1986 and 1995. Statistical analyses indicate that, at the national level of aggregation, decreasing trends (see Table 5-5 below) exist for chlordane, DDT, and dieldrin contamination in mussel and oyster tissue. These trends are attributed to the fact that uses of these chemicals have been canceled. Although these data generally show decreasing contamination trends, information gathered in the Mussel Watch program also reflects the ubiquity of Level 1 pesticide contamination in the nation's Great Lakes and coastal waterways.

Further, the occurrence and location of some fish consumption advisories indicates that at least some potentially ecologically sensitive water resource areas may have been affected by the Level 1 pesticides. For example, a number of the major estuaries listed in the National Estuary Program (NEP) and/or designated as National Estuaries Research Reserve System (NERRS) sites are under fish, waterfowl and/or shellfish advisories due to Level 1 pesticide contamination, as shown in Table 5-6 below.

Appendix B contains more detailed information on the specific ecological impacts that have been attributed to each of the Level 1 pesticides.

**Table 5-5. Numbers of NOAA Mussel Watch Sites (out of 186) with Increasing, Decreasing, or No Trend in Concentrations of Chlordane, DDT, and Dieldrin, 1986-1995**

| Chemical | Number of sites with an increasing trend | Number of sites with a decreasing trend [1] | Number of sites with no trend |
|---|---|---|---|
| Total chlordane | 1 | 81 | 104 |
| Total DDT | 1 | 38 | 147 |
| Total Dieldrin | 1 | 32 | 153 |

Source: NOAA. 1998 (on-line). Access: http://state-of-coast.noaa.gov/bulletins/html/ccom_05/ccom.html
[1] Chlordane, DDT, and dieldrin all showed significant decreasing trends, at the national level of aggregation, using statistical correlations developed for the median value of chemical concentrations among all sites (total = 186) sampled in each year from 1986 to 1995.

**Table 5-6. Level 1 Pesticide Fish and Wildlife Consumption Advisories at National Estuary Program and National Estuaries Research Reserve System Sites**

| Waterbody | Cause of Advisory |
|---|---|
| Hudson River, NY | Chlordane (for waterfowl) |
| New York / New Jersey Harbor | Chlordane |
| Barnegat Bay, NJ | Chlordane |
| Jaques Cousteau-Great Bay and Mulica River, NJ | Chlordane |
| Delaware Estuary, DE/NJ/PA | Chlordane |
| Columbia River, OR/WA | DDT |
| San Francisco Bay, CA | Chlordane, DDT, dieldrin, other unspecified pesticides |

Source: USEPA. 1999a. Access: http://www.epa.gov/ost/fish

### 5.2.6 Food and Food Commodities

In addition to impacting wildlife directly, elevated levels of organochlorine pesticides in the environment can pose a potential human health risk through contamination of the food chain. For example, USDA's Pesticide Data Program (PDP) monitors various pesticides, including DDT, aldrin/dieldrin and chlordane, on a variety of raw and processed fruits and vegetables and milk of domestic and imported origin. In recent years, this monitoring program has detected DDT and its metabolites in 3-5% of all samples, with winter squash (fresh and frozen), milk and spinach (canned and fresh) having most of the detections. Dieldrin and chlordane and metabolites were also found, predominately in winter squash samples of domestic origin. Detections of toxaphene and mirex were not reported (USDA, 1998).

Residues of aldrin/dieldrin, chlordane, DDT, mirex, and toxaphene have also been detected by the Food and Drug Administration's (FDA) pesticide residue monitoring program. For the past several years, DDT and dieldrin have been among the most commonly detected pesticides in FDA's Total Diet Study foods, which include 261 table ready representative foods of domestic and imported origin. Toxaphene and chlordane were also detected but to a lesser extent. In 1998, DDT accounted for 21 % of the total occurrences, more than any other pesticide, in foods monitored. Dieldrin accounted for about 10% of the total detections. The overall rate of detections of the Level 1 substances in the FDA data is generally higher than that of the PDP and may be due to the inclusion of a wider variety of foods, including meat and fish products, than the PDP tests (FDA, 1998).

As the PDP data suggest, the occurrence of detectable residues of the Level 1 pesticides is more frequent on samples of domestic origin than on imported samples. For DDT, dieldrin, chlordane, and mirex, detectable levels were four to eight times more likely to be found on domestic samples than on imported. The amount of detections in the monitoring data suggest a continued persistence and ubiquity of the Level 1 pesticides. In fact, their occurrence in monitoring data exceeds that of many actively registered and used pesticides. Because the uses of the Level 1 pesticides have long been canceled in the U.S., the primary source of these residues on domestic food and feed is likely to be from reservoir sources and former use sites.

Data from U.S. and overseas sources, as reported in the Greenpeace Research Laboratories Report *Recipe for Disaster* (March 2000), suggest that levels of DDT and other Level 1 pesticide exposure from food have generally declined substantially since the 1970's, except in areas where usage has increased during the period. Populations with the highest fish consumption have a high intake of organochlorines and breast milk is a source of high organochlorine intake for infants.

Also indicative of the potential for human exposure to the Level 1 pesticides resulting from food contamination, as well as showing the extent of the existing reservoirs of contamination in various environmental media, are the recurring incidences of fish and wildlife consumption advisories due to Level 1 pesticides throughout the United States. According to EPA's National Listing of Fish and Wildlife Advisories database (http://www.epa.gov/ost/fish/), which is a compilation of all available information describing state-, tribal-, and federally-issued advisories in the U.S., numerous fish and wildlife consumption advisories can be attributed to each of the Level 1 pesticides. Lakes Superior, Michigan and Huron are all under lakewide fish consumption advisories for chlordane, and Lake Ontario is under an advisory for mirex (USEPA, 1999a). An overview of the relative numbers of fish and wildlife consumption advisories for the Level 1 pesticides, as of December 1998, is shown in Table 5-7 below. The geographical distribution of these advisories across the U.S. is shown in Figure 5-1. Additional data on the actual waterbodies affected and the fish and wildlife species of concern under each advisory are available on the NLFWA internet database, which is updated regularly to reflect the latest information submitted by states and tribes. Although these numbers should be interpreted with caution because states may vary with respect to criteria for issuing advisories, some states do not have active fish advisory programs, and some states do not actively monitor for chlordane in fish tissue, the data do indicate that Level 1 pesticide contamination of waterways occurs in many states, and that at least some populations and geographical areas may be at potential risk due to Level 1 pesticide exposure.

**Table 5-7. Overview of Fish and Wildlife Consumption Advisories for the Level 1 Pesticides, December 1998.**

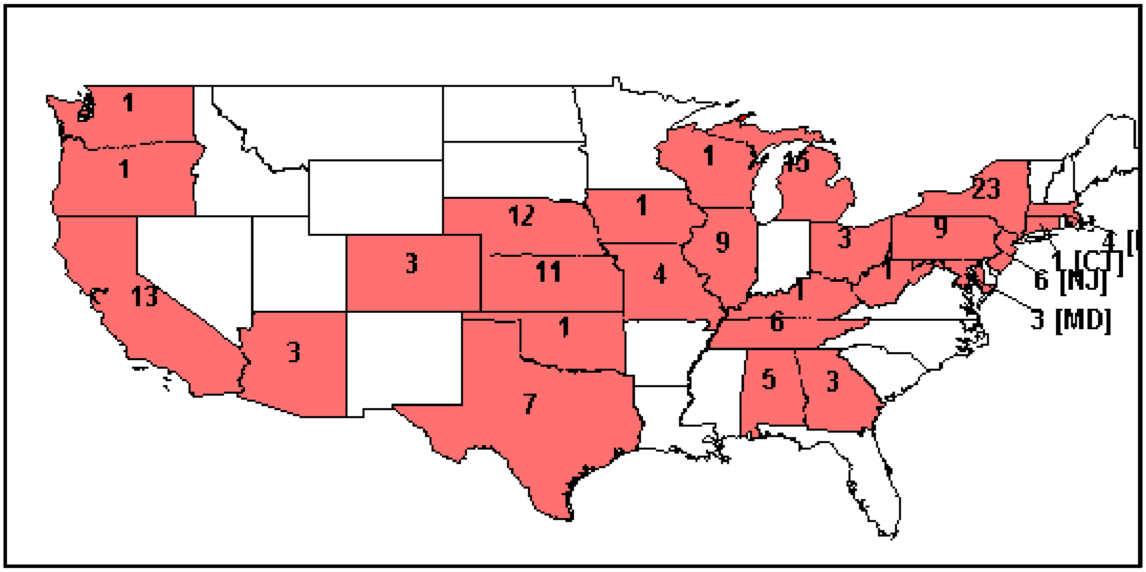
| Level 1 Pesticide | Number of active consumption advisories [1] | Number of states with consumption advisories | % of all advisories issued in the United States [2] | Trend in number of advisories | Statewide or Regionwide advisories |
|---|---|---|---|---|---|
| Aldrin/dieldrin | 23 | 6 | 0.92% | *information needed* | none |
| Chlordane | 104[3] | 22 | 4.1% | declining (117 in 1997) | NY statewide |
| DDT/DDD/DDE | 34[3] | 11 | 1.4% | increasing slightly (33 in 1997) | NY statewide |
| Mirex | 11[3] | 3 | 0.44% | *information needed* | NY statewide |
| Toxaphene | 6 | 4 | 0.24% | relatively unchanged since 1993 | none |

Source: USEPA, 1999b. December 1998 Update to the National Listing of Fish and Wildlife Advisories. Access: http://www.epa.gov/ost/fish

1 Number represents the total number of waterbodies under advisory; some waterbodies have multiple advisories (e.g., various fish and wildlife species, various restricted populations, various waterbody segments, various chemical substances). For information updates on advisory numbers, as they are released by states and tribes, see the internet website

2 Total number of fish and wildlife advisories in the U.S. as of December 1998 was 2,506 (total number of waterbodies)

3 Statewide advisory (New York) included in counts




Source: USEPA, 1999b. December 1998 Update to the National Listing of Fish and Wildlife Advisories. Access: http://www.epa.gov/ost/fish/

[1] The NLFWA database counts one advisory for each waterbody name or type of waterbody regardless of the number of fish or wildlife species that are affected or the number of chemical contaminants detected at concentrations of human health concern (in this case, the contaminants have been limited to the Level 1 pesticides).

[2] For the state of New York, the total count includes a statewide advisory (one) for waterfowl consumption for chlordane, mirex, and DDT in lakes and rivers. States without shading may indicate no fish advisories, no fish consumption advisory program, or no data available.

**Figure 5-1. Total Number[1] of Fish and Wildlife Advisories Caused by Level 1 Pesticides in Effect in Each State[2] in 1998**

## 6.0 EPA'S PROGRAMMATIC BASELINE

### 6.1 OVERVIEW OF CURRENT REGULATIONS AND PROGRAMS

Appendix B contains more detailed information on the specific statutes and regulations for each of the Level 1 pesticides. Because all of the Level 1 pesticides are, or were at one time, intentionally produced products, Agency efforts to reduce risk from these substances have historically focused on control of product manufacture and use. In the U.S., the manufacture and distribution of all the Level 1 pesticides has been prohibited, registered pesticide uses have been canceled, and food tolerances revoked. Voluntary pesticides collection programs, that are primarily maintained by states and other non-EPA entities to collect unused stocks of waste pesticides, are also currently important mechanisms for reducing potential risk associated with the Level 1 pesticides.

## 6.2 BASELINE ACTIVITIES

The following section presents a summary of the existing programmatic baseline for addressing the Level 1 pesticides. The activities discussed include those that are part of EPA's current ongoing programs addressing Level 1 pesticides, as well as relevant ongoing activities maintained by states and other non-EPA entities.

### 6.2.1 Products

## Current Pesticide Collection Programs

Many states and counties have addressed the problem of old accumulated stocks of agricultural pesticides by establishing waste pesticide collection and disposal programs, commonly called "Clean Sweeps."

These programs provide a simple way for farmers and other pesticide users to properly dispose of unwanted pesticides at little or no cost to the participants. Clean Sweep programs generally accept all unwanted pesticides; the Level 1 pesticides are only a subset of the targeted pesticides. All Clean Sweep programs accept pesticides from farmers. In addition, many programs also accept pesticides from other people and businesses, such as commercial pesticide applicators, golf courses, pesticide retailers, highway and railway maintenance departments, and households. Although those who still possess old stocks of many of the Level 1 pesticide products may be under the purview of RCRA Hazardous Waste Generator rules, some states provide participants limited amnesty from prosecution under hazardous waste regulations.

Households and some small businesses may also be able to dispose of unwanted pesticides at locally-run household hazardous waste (HHW) programs, which target all kinds of hazardous chemicals and products used by households, including pesticides. A third type of collection program is the hazardous waste management system established by the Department of Defense. These three types programs are discussed below.

### *State Clean Sweep Programs*

Because each state or local government which has implemented a Clean Sweep program has designed its program to fit its own needs and funding sources, there is no single "typical" Clean Sweep program. Some of the variations include:

! **Format:** The pesticides may be collected by holding single-day collection events where participants bring their pesticides to a centrally located site, by picking up pesticides from individual farms and facilities, or by establishing permanent collection sites.

! **Type of waste collected:** Some Clean Sweep programs accept only agricultural pesticides. Other agricultural waste pesticide collections may be combined with household hazardous waste programs, collecting both waste types at a single site but handling them separately.

- **Organizer:** Most Clean Sweep programs are run by the state Departments of Agriculture, which usually work closely with the state's agricultural extension service. A few Clean Sweep programs are organized by a different state agency, such as the state environmental agency, and in some states, counties run the Clean Sweep programs.

- **Funding source:** Clean Sweep programs have overwhelmingly been initiated, run, and, for the most part, funded by state or local governments. EPA has partially funded some programs through several kinds of grants. However, the amount of money contributed by EPA is minimal compared to the amount of money provided by the States. In addition, EPA's funding sources have been limited and available only intermittently, which makes it difficult for states to plan and carry out consistent programs. The states with comprehensive, long-term programs have found other funding sources, such as using a portion of the state pesticide registration fees, receiving a specific appropriation from the legislature, incorporating the program into an agency's budget, or assessing fees to participants.

- **Participants:** Because most Clean Sweep programs target agricultural pesticides, all of the programs accept waste pesticides from farmers. However, many programs allow other businesses or individuals to participate, including commercial applicators, golf courses, agrichemical dealers, other pesticide retail outlets, highway and railway maintenance departments and even households. A number of Clean Sweep programs are looking to expand the allowable participants, in response to requests from these other businesses that often have similar stocks of pesticides to be disposed, and to provide a service to rural communities. Occasionally, waste pesticide collection and disposal programs have focused on non-agricultural pesticide users. For example, Illinois collected about 19,000 pounds of unwanted pesticides from 63 structural pest control operator companies in 1998.

- **Disposal methods:** The vast majority of pesticides collected through Clean Sweep programs – including the Level 1 pesticides – are disposed of in permitted hazardous waste incinerators, although a small percentage require a different disposal method. For example, inorganic pesticides such as lead arsenate cannot be incinerated and are disposed of in permitted hazardous waste landfills. In addition, some pesticides (such as 2,4,5-T and Silvex) contain or potentially contain dioxin and therefore must be disposed of in an incinerator specifically permitted for dioxin.

- **Accomplishments (all pesticides):** Clean Sweep programs have been successful in removing all kinds of agricultural pesticides (not only PBT pesticides) from the environment and ensuring the proper management of these materials. Based on the available results of these programs from 1988 through 1998 (with some 1999 data), the accomplishments of Clean Sweep programs in the United States include:

- Clean Sweep programs have collected and disposed of more than 18 million pounds of *all* pesticides.
- All but five states have collected and disposed of some agricultural pesticides.
- Almost half of the states have had continuous Clean Sweep programs since 1995 or earlier.

- **Accomplishments (Level 1 pesticides):** The Level 1 PBT pesticides are regularly collected by Clean Sweep programs, although EPA does not have enough data to fully characterize the quantities of these pesticides collected so far. However, the amounts of the Level 1 pesticides collected in Minnesota from the late 1980's through 1998 – the most comprehensive data currently available on the quantities of specific pesticides collected by a state Clean Sweep program – provide an indication of the potential magnitude of PBT pesticides that might have been collected nationwide. Multiplying the percent of the total pounds of pesticides collected in Minnesota (6.16 % as shown in Table 6-1) by the nationwide total for all pesticides collected (approximately 18 million pounds) would yield a preliminary estimate of about 1.1 million pounds of Level 1 PBT pesticides collected nationwide so far. While this approach assumes that the percentage of Level 1 pesticides collected in Minnesota is representative of the entire country, and the accuracy of this assumption is debatable, the Minnesota data is the most comprehensive, long-term information available on the amounts of individual Level 1 pesticides collected. In addition, because the Minnesota collections were conducted over a period of time, the effect of fluctuations in quantities of Level 1 pesticides collected from event to event on the overall estimate is minimized. Therefore, until better data becomes available, an estimate of the amount of Level 1 pesticides that may have been collected across the U.S. was made using Minnesota collection data for all PBT pesticides. Additional data on the Minnesota collection program are provided in Appendix D.

Currently in the U.S., a total of 21 states have on-going, permanently funded, continuous Clean Sweep programs. There are 17 other states which also have continuous program, but which are not permanently funded. Thirteen states have intermittent, and 4 states have held one Clean Sweep event. To date, there are 5 states which have never held a Clean Sweep event.

**Table 6-1. The Percentage of Level 1 Pesticides Collected by Clean Sweep Programs in Minnesota through 1998**

| Pesticide [1] | Percentage of Total Pesticides Collected in Minnesota (%) [2] |
|---|---|
| DDT | 3.42 |
| chlordane | 1.26 |
| toxaphene | 1.01 |
| aldrin | 0.27 |
| dieldrin | 0.20 |
| All PBT pesticides | 6.16 |

[1] No data were reported for mirex.
[2] This column represents the percent of the total represented by each pesticide collected in Minnesota from the late 1980s through 1998. It was calculated using the total amount (pounds) of the individual pesticide collected through 1998 and the total amount (pounds) of all pesticides collected through 1998.

### *Household Hazardous Waste Collection Programs*

Clean Sweep programs focus on the collection and disposal of agricultural pesticides. However, many pesticides are used in and around homes, so there are also stocks of household pesticides that require disposal. According to federal waste regulations, household wastes are not hazardous wastes and can be disposed as regular household trash regardless of their composition. Another option, however, is for household pesticide users to dispose of waste pesticides at one of the growing number of household hazardous waste (HHW) collection programs. In 1997, there were over 3,300 HHW collection programs nationwide, including more than 440 permanent HHW programs.

As with Clean Sweeps, HHW programs vary in structure. Most accept a wide range of materials, including paint, motor oil, antifreeze, batteries, pesticides, and other unwanted chemicals products. Some programs accept materials only from households, while others accept materials from small businesses including farmers.

While data to estimate the total amount of pesticides collected at HHW programs is lacking, a review of reports from several states and the District of Columbia indicates that pesticides (not just Level 1 pesticides) typically account for 5% to 10% of the total amount of material collected by programs limited to households. The only information we have about the amounts of Level 1 pesticides comes from New Jersey, which maintains a data base with the amounts of hazardous wastes shipped from county waste collection programs. Some of the counties accept waste from businesses and some are limited to households. Table 6-2 presents the quantities of the Level 1 pesticides that were shipped for disposal from New Jersey county waste collections.

**Table 6-2. Amounts (in pounds) of Level 1 Pesticides[1] from County Waste Collection Programs Disposed in New Jersey**

| Pesticide[1] | 1997 Quantity (lb) | 1998 Quantity (lb) | Total Quantity (lb) |
|---|---|---|---|
| aldrin | 1,020 | 10,421 | 11,441 |
| dieldrin | 6,054 | 0 | 6,054 |
| chlordane | 29,488 | 15,844 | 45,332 |
| DDD | 583 | 0 | 583 |
| DDT | 24,649 | 4,310 | 28,959 |
| All PBT pesticides | 61,794 | 30,575 | 92,369 |

[1] Because mirex is not classified as a hazardous waste, no data were available. No toxaphene was listed as being disposed.

### *Current EPA Activities Supporting Clean Sweeps*

EPA has supported Clean Sweep programs in several ways, which are listed below. However, the actual level of EPA support (both direct financial support as well as work products or information exchange) is minimal compared to the contributions from the states and counties which run the programs.

- EPA has partially funded some Clean Sweep programs through several kinds of grants, normally distributed by the EPA Regional offices.

- Over the past several years, EPA has collected and consolidated information provided by program managers about Clean Sweep programs in general and specifically about the quantities of pesticides collected per year by each program.

- Using this information on the quantities of pesticides collected, EPA is currently preparing a report on the status and success of Clean Sweep programs nationwide. The report is intended to present the status of Clean Sweep programs nationwide and to independently promote these programs by publicizing their success and providing information on the many different ways to start, operate, and fund them.

- In FY1999-2000, EPA funded several pilot projects to facilitate the collection of data on the quantities of specific pesticides, including Level 1 pesticides, collected in Clean

Sweep programs. Historically, most Clean Sweep programs have only monitored the total quantity of all pesticides collected.

### *Department of Defense (DOD) Hazardous Waste Management System*

The Defense Reutilization and Marketing Service (DRMS) in the DOD handles the majority of offsite disposal of hazardous wastes for DOD. DRMS has developed a disposal system that includes a network of regional service contracts for hazardous waste disposal, systematic monitoring and review of the facilities used on these contracts, and tracking the items disposed. Currently, DRMS is establishing a procedure to allow non-DOD Federal agencies to use this disposal system for their own disposal needs on a reimbursable basis. This could facilitate the disposal of PBT pesticides that may currently be stored at Federal facilities at a reasonable cost by using an existing system.

## Current International Efforts to Control Level 1 Pesticide Products

At the international level, the U.S. is involved in various activities and negotiations to reduce and/or eliminate the use of Persistent Organic Pollutants (POPs), including the Level 1 pesticides. For example, the U.S. is supporting the work of the World Health Organization to assist developing countries in phasing-out the use of DDT for malaria control under the Rollback Malaria Program. In addition, EPA is working on a regional basis to eliminate the use and production of DDT in Mexico and Central America. Key global and regional activities related to Level 1 pesticide products are summarized below. For additional information on these and other international efforts, refer to the EPA Office of Pesticides Programs homepage at http://www.epa.gov/oppfead1/international/. This homepage contains Internet links to other important sites. In addition, key global and regional activities related to transboundary air pollution, which in many cases overlap with the international activities related to products described below, are summarized in section 6.2.3 of this report.

- **UNEP Global Treaty on Persistent Organic Pollutants (POPs)**. In July 1998, the United Nations Environment Program (UNEP) convened the Intergovernmental Negotiating Committee (INC) in Montreal, Canada, to prepare a legally-binding instrument for implementing international action on an initial list of twelve POPs, including the Level 1 pesticides: aldrin, chlordane, DDT, dieldrin, mirex, and toxaphene. The INC consists of representatives from over 100 countries, observers from multilateral organizations and NGOs and is facilitated and supported by UNEP. Since 1998, negotiators have met at four INCs to develop draft treaty language that eliminates the production and use of POPs pesticides, though several country-specific exemptions are currently requested for some of them. There is fairly wide agreement that the continued use of DDT restricted only to disease vector control should be allowed. It is expected that the negotiations will be completed in December 2000 in South Africa.
  Also under the auspices of the global POPs treaty, EPA is working with UNEP to implement an Obsolete Pesticides Project in the Russian Federation. As part of this

project, UNEP workshops in 4 to 6 regions are being held this year that include training for conducting inventories followed by inventory development exercises in each region. In addition, UNEP Chemicals and EPA are conducting pilot projects in 4 African countries (Tanzania, Côte d'Ivoire, Mali and Nigeria) to provide internet access and training to chemicals management officials and managers in Africa. Depending on the success of the pilots and future funding, the project may be expanded to provide internet connectivity to chemicals managers lacking such access in the rest of the developing nations.

UNEP has a POPs Home Page with more information at http://irptc.unep.ch/pops/.

- **UNEP/FAO Prior Informed Consent (PIC) Procedure**. In September 1998, under the auspices of the United Nations Environment Program (UNEP) and United Nations Food and Agriculture Organization (FAO), a global international agreement on a Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was signed by approximately 60 countries. This agreement builds on an earlier voluntary program that involved 150 countries. Once ratified by 50 countries, the PIC establishes international obligations for export controls of listed substances, notifications for export of banned and severely restricted substances, development of chemical profiles on the listed substances, and exchange of information. It is intended to encourage informed decision making about import and use of the listed substances and will build capacity for chemicals management in developing countries around the world. At the time of its signing, the Agreement included 17 banned pesticides (including aldrin, chlordane, dieldrin, and DDT), five hazardous pesticide formulations, and five industrial chemicals. At the first meeting of the International Negotiating Committee after signature, it was agreed to add two pesticides, toxaphene and binapacryl, to the procedure.

- **UN FAO International Obsolete Pesticides Program**. As many developing countries have neither the capacity or facilities for disposal nor the financial resources to properly dispose of obsolete pesticides, in 1994 the United Nations Food and Agriculture Organization (FAO) initiated the development of a international obsolete pesticides program in three pilot countries. This effort is intended to provide assistance to developing countries with problems related to obsolete pesticide stocks. FAO Activities to date have included the establishment of a foundation with multi-donor involvement to provide financial assistance; development of guidelines and training manuals on accumulation prevention, best disposal, and stock management; and providing disposal assistance through the end of 1999. U.S. EPA currently supports this international effort in an advisory and technical capacity.

- **Coordinating Group on Obsolete Stocks.** UNEP Chemicals together with the Food and Agricultural Organization, the Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, the

World Health Organization, and the Organization of Economic Cooperation and Development have formed a Coordinating Group on Obsolete Stocks. It will function under the auspices of the Interagency Organization for the Management of Chemicals. Its objectives are to raise awareness about the disposal problem, develop and propose effective responses, and ensure the limited resources are coordinated for maximum result. Initial steps will include a baseline study describing the nature and extent of the problem, possible solutions, and current activities, with release expected in late 2000.

- **International workshop on obsolete pesticides**. A Workshop on Obsolete Pesticides is being planned by the Organization for Economic Cooperation and Development (OECD), FAO and UNEP, for September 2000 in Alexandria, Virginia. The U.S. EPA is helping with the planning stages and will host the workshop with assistance from the Danish Environmental Protection Agency and the Polish Plant Protection Institute. The purpose of the workshop is to draw attention to, and inspire a concerted international effort to solve the problem of obsolete pesticides.

- **FAO/UNEP Expert Group on Termite Biology.** Alternative ways of controlling termites is the focus of an expert group established by FAOs Global Integrated Pest Management Facility, and UNEP Chemicals as the result of a recent joint expert workshop (February 2000). Heptachlor and two PBT pesticides, chlordane and mirex, are still being used to control termites to protect agricultural crops and in building construction.

- **Training Course: Pesticide Disposal in Developing Countries.** EPA has developed a training course on pesticide disposal in developing countries. This is one of several of the international training modules offered by EPA (more information at: http://www.epa.gov/oia/modules.htm). The course, which is designed to be delivered on a regional basis, suggests decision-making techniques for countries and regions faced with the disposal of large quantities of obsolete or unwanted pesticides. The course teaches participants to: conduct and evaluate pesticide inventories; select management and disposal options for bulk quantities; dispose of empty containers; protect workers entering storage sites; stabilize and clean up storage sites; develop a communication strategy; and prevent the build-up of unwanted stocks in the future.

- **Regional Environmental Program for Central America - Pesticide Project.** In cooperation with USAID, EPA conducted training, assisted in assessing national pesticide regulatory systems and developed a regional plan for the safe disposal of obsolete pesticides.

- **USAID African Pesticide Disposal Initiatives.** USAID has been supporting obsolete pesticide disposal initiatives in a number of African countries. For example, USAID has provided technical assistance and capacity building to develop disposal programs (Ethiopia and other countries), assess the problem of stockpiles (Mali) dispose of stockpiles (Niger), and conduct pesticide management training (Uganda, Guinea or Ghana).

- **NAFTA Technical Working Group on Pesticides.** In 1996, under the North American Free Trade Agreement (NAFTA), the U.S., Canada, and Mexico formed a Technical Working Group (TWG) on pesticides to harmonize regulatory systems and address potential trade problems caused by differing regulatory practices. This work focuses on specific trade irritants, often caused by national differences in Maximum Residue Limits (or tolerances), and seeks to develop a better understanding of each regulatory agency's assessment practices in order to harmonize each country's procedures and requirements. Several projects are supported by the TWG which involve the joint review of pesticides, coordinated programs on integrated pest management, and regulatory capacity building. The TWG also works with stakeholders and encourages pesticide registrants (product owners) and growers to coordinate activities on a regional level.

- **CEC Tri-lateral North American Regional Action Plans for Chlordane and DDT.** In June 1998, Canada, Mexico, and the U.S. published North American Regional Action Plans (NARAPs) for chlordane and DDT under the Sound Management of Chemicals (SMOC) Program administered by the Commission for Environmental Cooperation (CEC). The objectives of the NARAP for Chlordane is to reduce exposure to chlordane through the phase-out of existing registered uses. As of May 1999, chlordane is no longer registered for use in any of the three countries and is no longer manufactured in North America. For DDT and its metabolites, the NARAP objectives are to reduce exposure through the phased reduction (80% by 2001), leading to the eventual elimination, of DDT used for malaria control in Mexico, as well as the elimination of illegal uses of DDT. The NARAP for the Phase-Out of DDT supports a holistic approach to malaria control, bringing together an integrated pest control management strategy for the vector as well as the full spectrum of related public health activities and services. It also calls for a regional perspective that encourages the sharing of experiences with other Latin American and Caribbean countries to ensure that malaria continues to be controlled throughout the Region. The three countries are working together in identifying potential sources of funding. Mexico has indicated that $1.5 million will be needed in the next 2 years to test and evaluate alternatives and to address the needs of the health services sector. Much of the needed funds will be provided by the CEC and the International Development Research Center (IDRC) in Canada. In addition, the Global Environment Facility (GEF) is funding a multi-million dollar project to phase-out the use of DDT in Central America, building on the experience in Mexico. To date, a 50% reduction in the use of DDT has been achieved in Mexico, indicating that the reduction goal of 80% by 2001 is on schedule.

  In response to the lack of regional-level monitoring data on suspected regional transport pathways and the transfer of toxic pollutants between Mexico, the U.S., and

Canada, the FY99-01 action plan of the CEC calls for several strategic initiatives in support of the SMOC Program, such as monitoring, modeling, and assessing the status and trends of chemicals in the North American Environment in conjunction with the CEC air program.

- **WHO Efforts to Reduce Reliance on DDT for the Control of Malaria.** In conjunction with the negotiations of the INC to reduce/eliminate the use of POPs, the U.S. is coordinating with the World Health Organization's DDT Panel of Experts to develop a global WHO Action Plan for the gradual phase-out of DDT used for public health purposes such as malaria vector control. WHO is engaged in a broad based effort to assist countries in controlling malaria, utilizing integrated strategies based on the promotion of health services. Roll Back Malaria (RBM), a partnership led by WHO with private and public sector institutions (i.e., World Bank, UNICEF), provides a diverse network for mobilizing action toward strengthening malaria control programs worldwide. Through the RBM program, WHO has the capability to integrate DDT reduction efforts into the broader framework of the international negotiations on Persistent Organic Pollutants (POPs). Coordination with Member States (including the U.S.), the UN Environment Programme (UNEP), and the UN Food and Agriculture Organization (FAO) will help promote the sound management of POPs in general, and will leverage support for needed activities to address DDT and the development of environmentally sound and safe alternatives.

  In June 1999, the World Health Organization (WHO) convened an expert consultation to draft a framework for action to reduce reliance on DDT for public health. This activity was organized on the basis of the World Health Assembly Resolution WHA50.13. The Resolution calls upon Member States to take steps to reduce reliance on insecticides for control of vector-borne diseases in accordance with WHO guidelines and through support for the development and adaptation of viable alternative methods of disease vector control. The Resolution also calls upon Member States to ensure that the use of DDT is restricted to public health programs that take an integrated approach, while taking steps to prevent diversion of DDT for use outside of the health sector.

  Currently, WHO is in the process of finalizing the "Action Plan for the Reduction of Reliance on DDT" as well as a Workplan that identifies and prioritizes specific implementation activities. WHO intends to use their Action Plan and Workplan as a framework for technical assistance to its Member States and an instrument in support of the intergovernmental negotiations on the reduction and/or elimination of DDT use for public health purposes. This framework will ensure that public health concerns are fully considered and no opportunities are lost to maximize the public health benefits that may be derived from the transition from DDT to alternatives for vector control.

### 6.2.2 Land

Because of their hydrophobic nature, Level 1 pesticides in the environment often tend to be associated with soils and sediments. In terrestrial environments, this includes widespread contamination of agricultural lands, as well as more concentrated contamination of soils at former pesticide manufacturing, mix/load, and dealer/storage sites. Some contaminated agricultural lands may be converted into residential areas through development, although the extent of this potential exposure issue is unknown. Because there are few cost-effective options for reducing diffuse contamination of agricultural soils, the primary focus of Agency efforts regarding contaminated soils has been on Superfund activities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Corrective Action under the Resource Conservation and Recovery Act (RCRA).

Superfund was enacted to establish clean up requirements for uncontrolled, abandoned hazardous waste sites and to address future releases of hazardous substances into the environment. Superfund is a federally run program that was primarily designed to remedy the mistakes in hazardous waste management made in the past at sites that have been abandoned or where a sole responsible party cannot be identified. Cleanup at Superfund sites is primarily paid for by the Superfund Trust Fund with money derived mainly from taxes on the chemical and petroleum industries.

RCRA Corrective Action is a state-based program whose primary driver is the "clean-up" of permitted (RCRA Part B) sites that have been contaminated with hazardous chemicals. The RCRA Corrective Action Program is different than Superfund because it deals with sites that have viable operators and on-going operations. The Corrective Action Program encompasses active, or soon to be active facilities, that are permitted or seek a permit to treat, store, or dispose of hazardous waste. As a condition for obtaining a RCRA operating permit, these active facilities are required to clean up contaminants that are released or have been released in the past. RCRA facilities must pay for the cleanup at their site. In general, RCRA establishes a regulatory structure for the handling, storage, treatment, and disposal of materials defined as solid and hazardous wastes, which may include certain contaminated soils and sediments. Under RCRA, a soil material may be required to be managed as a hazardous waste if it is contaminated by a listed hazardous waste, or if it exhibits a hazardous waste characteristic. Required clean-up activities vary from region to region and state to state, although in general, the treatment standard for contaminated soil is based on the contaminant, the technology needed, and the level of clean up required. New soil treatment standards have been designed to encourage more cost-effective cleanup of hazardous contaminated soils subject to Land Disposal Restrictions (LDRs). Before these standards were developed, soils subject to LDRs were required to comply with traditional technology-based treatment standards at 40 CFR 268.40 developed for industrial hazardous waste. These treatment standards sometime proved to be inappropriate (e.g., not cost effective), or unachievable (e.g., did not account for heterogeneous soil matrices) when applied to hazardous constituents present in soil. Therefore, newer soil treatment standards provide for more flexible treatment requirements that consider the unique characteristics of soils and applicable treatment technologies, and are achievable using a variety of non-combustion treatment alternatives.

The highest concentrations of Level 1 pesticides in soils are primarily found at contaminated industrial sites (e.g., former manufacturing facilities) and contaminated dealer/storage sites. As discussed in section 5.2.2 and Appendix C, some pesticide manufacturing, formulating, handling or disposal facilities are on the Superfund National Priorities List and are managed under the Superfund program. However, the vast majority of sites that are contaminated as a result of pesticide storage, handling, or mixing/loading practices are not on the National Priorities List. Additionally, these pesticide-related sites are not treatment, storage, or disposal facilities under RCRA, so they are not managed under the RCRA corrective action program. Therefore, most pesticide storage, handling, or mixing/loading sites that are contaminated are managed under the authority of a state's statutes and regulatory programs. For example, the Minnesota Department of Agriculture has the authority to investigate and manage agricultural chemical contamination under the Minnesota Environmental Response and Liability Act, the Minnesota "Superfund". However, only a few states, including Minnesota, Wisconsin and Illinois, have comprehensive programs for managing pesticide-contaminated storage, handling and mixing/loading sites. Most states manage this type of contamination on a case-by-case basis.

### 6.2.3 Air

## Current International Efforts to Reduce Long-Range Transport (LRT)

Although the U.S. has long banned the use of the six Level 1 pesticides, some countries still allow their use. Because these pesticides are prone to long-range atmospheric transport and deposition, the U.S. may be subject to exposure from international sources. In response, the U.S. has become involved in various international fora to protect the U.S. and the global commons from certain PBT chemicals, including the Level 1 pesticides. These substances cannot be completely controlled through national programs, but warrant regional and/or global action to control their production and use. The work at the global level builds on several existing regional agreements, with the overall intent of providing assistance to developing countries as they phase out the use of commercially produced chemicals, and to assist them with the safe disposal of current stocks of POPs and other unwanted pesticides.

Key global and regional activities related to transboundary air pollution are summarized below. For additional information on these and other international efforts, refer to EPA's Office of Pesticides Programs homepage at http://www.epa.gov/oppfead1/international/. This homepage contains Internet links to other important sites. In addition, key global and regional activities related to products, which in many cases overlap with the international activities related to transboundary air pollution described below, are summarized in section 6.2.1 of this report.

- **Regional Protocol Negotiated under LRTAP POPs.** In February 1998, members of the United Nations Economic Commission for Europe (UN-ECE) completed negotiations on a regional legally-binding protocol on Persistent Organic Pollutants (POPs) under the Convention on Long-Range Transboundary Air Pollution (LRTAP) Convention. The UN-ECE region covers the Russian Federation, the Newly Independent States, Central and Eastern Europe, Western Europe, Canada, and the United States. The protocol was signed in June 1998 in Aarhus, Denmark and will enter into force once it has been ratified by 16 parties. The objective of the LRTAP protocol is to control, reduce, or eliminate discharges, emissions, and losses of certain persistent organic pollutants. It will regulate sixteen compounds, and will specifically ban the production and use of the pesticides: aldrin, chlordane, dieldrin, mirex, and toxaphene. The protocol will also ban production and limit uses DDT. Additional information on the LRTAP protocol is available on the internet at http://www.unece.org/env/lrtap/protocol/98pop.htm

! **UNEP Global Treaty on Persistent Organic Pollutants (POPs)**. As described in section 6.2.1 above, in July 1998, the United Nations Environment Program (UNEP) convened the Intergovernmental Negotiating Committee (INC) to prepare a Global Treaty to implement international actions on 12 POPs, including the Level 1 pesticides: aldrin, chlordane, DDT, dieldrin, mirex, and toxaphene. As the ultimate goal of the treaty will be to "reduce and/or eliminate releases of POPs", international efforts under the global POPs treaty will contribute to a reduction in long-range transport.

! **Binational Toxics Strategy (BNS).** In April 1997, the U.S. EPA and Environment Canada agreed to a plan to protect public health by working towards a goal of virtual elimination of persistent toxic substances from the Great Lakes Basin. The agreement, the Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes Basin (also known as the Great Lakes Binational Toxics Strategy (BNS)), provides an established process for engaging stakeholders and seeking voluntary reduction efforts. A major challenge of the Binational Toxics Strategy is to assess atmospheric inputs of persistent toxic substances to the Great Lakes and, if long-range sources are confirmed, to work within international frameworks to reduce releases of such substances. With regard to pesticides, the plan seeks confirmation that there are no releases of six bioaccumulative pesticides: chlordane, aldrin, dieldrin, DDT, mirex and toxaphene. In December 1998, EPA's Great Lakes National Program Office (GLNPO) released a draft report entitled, *Draft Pesticides Report in Response to the Great Lakes Binational Toxics Strategy*. A final report will be released in 2000. The report presents and analyzes data on the environmental presence of chlordane, aldrin/dieldrin, DDT, mirex, toxaphene in the Great Lakes, along with probable and suspected sources. The report fulfills a "challenge" created by the Binational Toxics Strategy for EPA to confirm by 1998 the elimination of uses and releases of the pesticides from sources that enter the Great Lakes. Additional information on the BNS is available on the internet at http://www.epa.gov/docs/grtlakes/bns/.

**Air Monitoring and Research**

! **Integrated Atmospheric Deposition Network (IADN).** IADN conducts research to determine the atmospheric loadings of toxic substances to the Great Lakes system and define temporal (over time since 1990) and spacial trends. Among other toxic chemicals, IADN currently monitors the atmospheric deposition of aldrin, chlordane, DDT/DDE, dieldrin, mirex, and toxaphene. Additional information on the

IADN programs is available on the internet at: www.epa.gov/glnpo/iadn.

- **Arctic Monitoring and Assessment Program (AMAP) Air Research.** AMAP was established in 1991 to implement components of the Arctic Environmental Protection Strategy (AEPS) adopted by eight Arctic countries including the United States. The program was given responsibility to monitor levels and assess the effects of selected anthropogenic pollutants in all compartments of the Arctic. In 1998, the AMAP Assessment Report: *Arctic Pollution Issues* was published, that indicated that sources exist outside the Arctic for a number of POPs. Over much of the Arctic, the levels of POPs cannot be related to known use and/or releases from potential sources within the Arctic and can only be explained by long-range transport from lower latitudes. Among the main contaminants of concern are organochlorine pesticides and their metabolites from agricultural activities, industrial chemicals (e.g., PCBs), and anthropogenic and natural combustion products. Additional non-air AMAP research is discussed in sections 6.2.5 and 6.2.6 below. Further information on the AMAP program is available on the internet at http://www.grida.no/amap/ .

#### 6.2.4 Water and Sediments

**Current Programs**

The Clean Water Act (CWA) regulates discharges of pollutants to surface waters with the overall goal to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. To address the risk of contaminated runoff, storm water permits are required for any storm water discharge associated with industrial activity, a large or medium municipal storm sewer system, or a discharge which EPA or the State determines to contribute to a violation of a water quality standard or is a significant contributor of pollutants to waters of the United States. All of the Level 1 pesticides, except mirex, are considered toxic and/or priority pollutants under the CWA and may be regulated in these programs. Several other current programs which address pesticides in water and sediments are described below.

- **State Lists of Impaired Waters.** The Clean Water Act (Section 303(d)) requires States to develop lists of impaired and threatened waters and submit them to EPA every two years, and to establish "total maximum daily loads" (TMDLs) for listed waters. These lists can be used to target geographic areas for outreach and remediation efforts.

- **SDWA / CCL.** As required by the Safe Drinking Water Act (SDWA), EPA has recently released the final Drinking Water Contaminant Candidate List (CCL). EPA is required to publish this list of contaminants which, at the time of publication, are not subject to any proposed or promulgated national primary drinking water regulation (NPDWR), that are known or anticipated to occur in public water systems, and which may require regulations under the SDWA [section 1412(b)(1)]. At this time the CCL identifies 49 chemical and 10 microbiological contaminants/contaminant groups which will be subject to further evaluation, including aldrin, dieldrin, and DDE. By the year 2001, five or more of these contaminants may be chosen for potential regulation. Although the CCL contaminants are currently only in the evaluation and analysis stages, determinations will be made on which substances to prioritize for future actions. If chosen, contaminants may be subject to extensive future actions under the Agency's drinking water program that would be expected to significantly reduce drinking water exposure to the chosen pesticides, including drinking water research, occurrence monitoring, guidance development, health advisory development, and future drinking water regulations.

! **Contaminated Sediment Management Strategy.** Numerous federal statutes give EPA the authority to address contaminated sediments, including: the National Environmental Policy Act (NEPA); the Clean Air Act (CAA); the Clean Water Act (CWA), the Coastal Zone Management Act (CZMA); the Marine Protection, Research, and Sanctuaries Act (MPRSA); the Resource Conservation Recovery Act (RCRA); the Toxic Substances Control Act (TSCA); and the Comprehensive Environmental Response and Compensation Act (CERCLA). However, implementation of sediment management under the different regulatory programs, as well as implementation of substance-specific regulatory approaches, has increased the potential for conflicts, inconsistencies, and inefficiencies in procedures for assessing risks associated with contaminated sediments, research efforts, technology development, and field activities. To address these conflicts, EPA's Contaminated Sediment Management Strategy was developed. This strategy summarizes EPA's current knowledge of sediment contamination and provides a cross-program policy framework necessary to bring about reduction of risks posed by contaminated sediments. The strategy advocates cross-program coordination, as well as a watershed approach, to prevent and remediate existing sediment contamination and to prevent future contamination. Actions required to manage contaminated sediment sites include source control, pollution prevention, and remediation. EPA has established four goals to guide future efforts to manage contaminated sediment: 1) prevent the volume of contaminated sediment from increasing; 2) reduce the volume of existing contaminated sediment; 3) ensure that sediment dredging and dredged material disposal are managed in an environmentally sound manner; and, 4) develop scientifically sound sediment management methods. EPA's Contaminated Sediment Management Strategy (EPA-823-R-98-001), published in April 1998 to help the nation achieve these goals, is available on the internet at http://www.epa.gov/OST/cs/strategy.pdf

! **CERCLA Guidance Document.** Superfund is currently developing a guidance document to aid regional remedial project managers (RPMs) in decision-making when remediating contaminated sediments. This guidance document works from the assumption that risk already exists when looking at the feasibility study. The overall effort is to establish an endpoint of acceptable criteria to manage risk.

## <u>Water and Sediments Monitoring and Research</u>

! **National Water Quality Assessment Program.** The National Water Quality

Assessment (NAWQA) Program, administered by the USGS, involves monitoring and sampling of water, sediments, and fish in the waters of the U.S.. Samples are analyzed for a variety of organic and inorganic constituents, including DDT and metabolites, three principal components of technical chlordane, and dieldrin. The program is divided into 59 study areas. More information on the NAWQA is available on the internet at http://water.usgs.gov/pubs/circ/circ1225/**.**

- **National Sediments Database.** The Office of Water (OW) and the Office of Science and Technology (OST) have a national sediment database. However, this database does not specifically track the progress of clean-up regarding the removal of contaminated sediments. In response to the Water Resources Development Act of 1992, which directed EPA to prepare a report to Congress on the environmental health of sediments in the nation's waterways, the *National Sediment Quality Survey Report to Congress* is prepared biennially. This report includes data on several of the Level 1 pesticides, including chlordane, dieldrin, and DDT, in sediments nationwide. It is prepared in conjunction with NOAA, the Army Corps of Engineers, and other federal, state, and local agencies. The next National Sediment Quality Survey Report to Congress is scheduled for completion in 2001. More information on the National sediments database is available on the internet at http://www.epa.gov/OST/cs/congress.html.

Current and planned EPA research on sediment remediation and exposure pathways includes:

- Evaluation of environmental dredging. In particular, information on the effectiveness of dredging (both long-term effectiveness in meeting cleanup goals, and short-term effectiveness concerns about particle resuspension).

- Confined disposal facility (CDF) treatment zones and caps. This research area focuses primarily on evaluation of enhancements to CDFs, including chemical addition, chemical barriers, and physical barriers to minimize contaminant transport.

- Depth of sediment-water-biota interaction zones. The determination of the depth below which contaminants are effectively sequestered from interaction with the ecosystem is an important research issue. Potentially Responsible Parties (PRPs) contend it is only the top few millimeters or centimeters that are important.
- Development of cost estimation techniques for the various remedial alternatives.

- Development of protocols for long-term monitoring at sediment sites.

- Development of a better understanding of the bioavailability of contaminants in sediments.

- Assessment of bioaccumulative chemicals (e.g., developing laboratory and field methods for assessing bioaccumulation, selecting species for bioaccumulation testing, and dose-response relationships for bioaccumulative contaminants).

- ! Further assessment of the effects of bioaccumulative chemicals by evaluating food routes of exposure, bioaccumulation, wildlife and human health endpoints of concern.

- ! Sampling and monitoring protocols for sediment contaminants.

### 6.2.5 Exposure Reduction

## <u>Current Programs</u>

The Agency currently provides the public with information on the risks of exposure and current data on the levels of the Level 1 pesticides in fish in the ongoing programs described below.

- ! **Fish Consumption Advisory Program.** As promised in the President's Clean Water Action Plan (EPA 840-R-98-001), EPA is currently working to have all States and Tribes establish comprehensive monitoring programs and risk-based fish consumption advisories. Specific activities include:

  <u>Working with State, Federal, and Tribal Agencies to Ensure Adoption of Consistent Methods for Developing and Communicating Fish Consumption Advisories</u>. EPA has issued a multi-volume National Guidance for States and Tribes on all aspects of how to establish a fully-protective fish consumption advisory program – from sampling and analysis to what works as effective communication. In 1998, EPA requested that States and Tribes review existing fish advisory program approaches and methodologies and compare them with recommendations in EPA's National Guidance. Areas of particular interest included monitoring strategies, risk assessment methods, communication strategies, and overall level of effort. In October of 1999 , EPA sponsored a national meeting to provide each State and Tribe an opportunity to present their advisory programs, identify any inconsistencies with the National Guidance, and discuss how inconsistencies can be rectified. As a result of the national meeting, the American Fisheries Society is publishing a report on State and Tribal advisory program consistency with EPA's national guidance. The National Guidance is routinely updated. Revised fish sampling and analysis and risk assessment guidance will be published in 2000. EPA is supporting research that will help improve the effectiveness of recommended methods of risk communication. EPA has also begun planning a national risk communication workshop to be held in March, 2001. Workshop participants will identify and develop risk communication methods most effective in reaching ethnically and economically diverse populations.

  <u>Outreach Brochures for Fish Consumption Advisories</u>. EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) have sponsored a nationwide effort to inform health professionals and their patients about the dangers of eating fish

harvested from contaminated waters. Through a letter to 100,000 pediatricians, obstetricians/gynecologists and family physicians across the nation, doctors were asked to advise their patients to pay attention to local fish consumption advisories. Doctors also received brochures aimed at the general public, written in English, Spanish, and Hmong (an Asian language), that describe how to safely consume fish and minimize exposure to contaminated fish. Copies of these brochures were sent in late 1998 to state and tribal environmental and public health professionals. EPA is currently working with ATSDR to develop and distribute a tool kit for health providers. The tool kit will provide additional information for nurses and physicians to use when talking to patients about the risks associated with contaminants in fish.

User-Friendly National Fish and Wildlife Consumption Advisories. The 1998 update for the National Listing of Fish and Wildlife Advisories (NLFWA) database is available from the U.S. Environmental Protection Agency (EPA) on the internet at http://www.epa.gov/OST/fish/. A 1999 update will also soon be available. This database includes all available information describing State-, Tribal-, and federally issued fish and wildlife consumption advisories in the United States for the 50 states, the District of Columbia and four U.S. territories, and has been expanded to include the 12 Canadian provinces and territories. The database contains information provided to EPA by the States, Tribes, and Canada as of December 1998. It has been made "user-friendly," and can be accessed by pointing and clicking on a map, by identifying a state, or by choosing water body or chemical name.

## Exposure and Effects Research

The Agency is currently conducting research, including those for sensitive populations, to better understand exposure pathways for PBT substances. For example, this research includes studies of ethnic populations in large urban areas, and research on children's exposures due to indoor air contamination. Important exposure and effects studies currently underway or planned are:

! **Children's Total Exposure to Persistent Pesticides and Other Persistent Organic Pollutants (CTEPP).** As young children are hypothesized to have greater exposures, as well as greater sensitivities, to persistent organic pollutants than older children or adults, the National Exposure Research Laboratory of EPA's Office of Research and Development (ORD) is beginning a three-year pilot study to investigate the exposures and risks to young children from these pollutants. The pilot study will involve about 260 preschool children (between 18 months and 5 years of age) in North Carolina and Ohio. Persistent pesticides, including: aldrin, dieldrin, α- and γ-chlordane, and DDT/DDE, will be measured in food and beverages consumed by the child, indoor and outdoor air, urine and hand-wipe samples from the child and adult caregiver, and samples of dust and play area soil. The data, collection of which are scheduled to begin in summer 2000 in North Carolina and in 2001 in Ohio, will be used to characterize children's exposure, understand pathways, and refine exposure models.

- **Umbilical Cord Blood Sampling in Alaska.** As contaminants of concern are known to be transported long-distance to U.S. territories and sensitive populations by air, water, and through the food chain, EPA's Office of International Activities (OIA), in partnership with the National Center for Environmental Health, the Indian Health Service and other Alaska organizations, is supporting a project to investigate the relationship between contaminant exposure in native women in Alaska and infant health. The program under the Arctic Environmental Protection Strategy (AEPS) was developed in response to Alaska Native concerns about the effects of organic and heavy metal contaminants, particularly from non-U.S. sources such as the Russian Federation, that are accumulating in subsistence foods species in the circumpolar north and their effects on the health of mothers and infants. The project involves monitoring levels of selected persistent organic pollutants (POPs), including chlordane, DDT and DDE, and toxaphene, in umbilical cord blood and maternal blood from individuals representing primary indigenous groups in northern Alaska. A total of 180 specimen pairs will be collected and analyzed. A yearly report that incorporates data from dietary surveys and measured contaminant levels from the cord blood study will be developed for distribution to collaborating agencies and Alaska natives. The report will also include an examination of significant relationships between any pollutant, or combination of pollutants, and maternal age, diet, obstetric history, complications of pregnancy, newborn measurements, abnormal infant development, malformations or serious infections points. The results are expected to (1) help native populations devise strategies to maintain their traditional diet while reducing exposure, (2) help monitor spatial and temporal pollutant accumulation, and (3) improve understanding of maternal-infant health effects of contaminants.

- **OECD Project on Risk Assessment Associated with Low Dose Exposure to PBT Pesticides.** In 1998, the Organization for Economic Cooperation and Development (OECD) initiated a Canadian-led project to assess the risks of low doses to persistent, bioaccumulative and toxic pesticides. The first phase, starting in mid-1999, was to send all member countries a questionnaire to obtain a clear understanding of the data and information that are used to evaluate the hazards associated with low-dose exposure to PBT pesticides. The information obtained from the questionnaire will be used to determine how the data are used by pesticide regulators on a routine basis. The next phase of this project is to determine the differences and similarities in how exposure and toxicity data are combined in preparing national risk assessments. A case study of a pesticide will be used to provide sample environmental data and information on the use pattern. Each respondent will be requested to complete a risk assessment based on the case study of this product. The results will be used to compare the method for using the endpoints derived from the data, terrestrial and aquatic risk scenarios, safety factors, and mitigative measures.

### 6.2.6 Monitoring

Monitoring programs (related specifically to air, water, and land) were discussed in sections 6.2.1 through 6.2.4. Other current monitoring program include:

### Monitoring of Biota / Biological Indicators

! **NOAA's National Status and Trends Program (Mussel Watch Project, Benthic Surveillance Program)**. The National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch Project has been using measurements of contaminants in mussel and oyster tissues since 1986 (and in fish livers and surface sediments since 1984) to evaluate the status and trends in contaminant levels in the nation's Great Lakes, estuaries, and marine waters. Sites are visited approximately biennially for collection of animals to be analyzed for a suite of over 70 contaminants, including aldrin, dieldrin, cis-chlordane, mirex, and DDT and metabolites. More information on the NOAA National Status and Trends Program is available on the internet at http://state-of-coast.noaa.gov/bulletins/html/ccom_05/ccom.html.

! **National Study of Chemical Residues in Fish**. EPA's Office of Water has begun work on a new study to provide information about persistent, bioaccumulative, and toxic chemicals in fish tissue. The objective of the study is to estimate the national distribution of the mean levels of about 274 analytes (including the Level 1 pesticides and breakdown products) in fish tissue from lakes and reservoirs of the continental United States. The lakes and reservoirs to be sampled were selected according to a probability design that is stratified into 6 lake size categories. Sampling will be conducted for 4 years at a total of 500 locations or about 125 lakes and reservoirs annually. Planning for the study began in 1998 and fish sampling and tissue analysis is being conducted from 1999 through 2002. The National Study of Chemical Residues in Fish does not currently include Alaska or Hawaii. More information on the fish tissue survey is available on the internet at http://www.epa.gov/ostwater/ or http://www.epa.gov/ostwater/pc/wqnews/spring99.html#16a

### Food Monitoring

! **FDA Monitoring Data for Pesticides on Food and Feed Commodities.** The Food and Drug Administration (FDA) monitors the concentrations of several organochlorine pesticides, including aldrin, dieldrin, chlordane, DDT, mirex, and toxaphene in domestic and imported food and feed commodities. The FDA has established action levels as a means of monitoring for occurrences that may be the result of something other than persistence in the environment.

! **U.S. Department of Agriculture's (USDA) Pesticide Data Program (PDP)**

**and Food Safety Inspection Service (FSIS)**. Under the PDP, USDA has been monitoring various pesticides, including DDT, aldrin/dieldrin and chlordane, on a variety of raw and processed fruits and vegetables and milk of domestic and imported origin for about seven years. USDA's FSIS also monitors several of the Level 1 pesticides on meat and eggs.

### Monitoring of Human Body Burdens

! **National Health and Nutrition Examination Surveys (NHANES)**. Conducted by the Centers for Disease Control and Prevention's (CDC's) National Center for Health Statistics, NHANES traces the health and nutritional status of U.S. civilians. The NHANES surveys beginning in 1999 will be used as a primary measure of human exposure to the Level 1 pesticides, including aldrin, dieldrin, α- and γ-chlordane, mirex, and DDT/DDE/DDD.

! **Arctic Monitoring Assessment Program (AMAP) Monitoring of Human Body Burdens.** AMAP was established in 1991 to implement components of the Arctic Environmental Protection Strategy (AEPS) adopted by eight Arctic countries including the United States. Primary components of this strategy include monitoring of the levels of, and assessing the effects of, anthropogenic pollutants in all compartments of the Arctic environment, including humans. Currently, DDT, DDE, and chlordane are included in the human monitoring program. Although the U.S. is a AMAP member country and participates in the AMAP Working Group, data collection on human body burdens is currently still in the planning phase in U.S. territories. However, in support of AMAP recommendations to assess health impacts of POPs and heavy metals in the Arctic, EPA and the National Center for Environmental Health are jointly funding the Alaskan Native Cord Blood Monitoring Program, as discussed in Section 6.2.5 "Exposure Reduction Research" above. Additional information on the AMAP program is available on the internet at http://www.grida.no/amap/ .

! **EPA's National Human Exposure Assessment Survey (NHEXAS).** NHEXAS was developed by EPA's Office of Research and Development (ORD) early in the 1990s to provide critical information about multipathway, multimedia population exposure distribution to chemical classes and to test the feasibility of conducting a national survey to provide estimates on the status of human exposure to potentially high-risk chemicals. NHEXAS was also designed to measure "total exposure" (i.e., the levels of chemicals participants take in through the air they breathe; the food, drinking water, and other beverages they consume; and in the soil and dust around their homes). As designed, NHEXAS has three phases, including: 1) development and validation of methods; 2) obtaining nationally representative exposure data; and 3) study of selected subpopulations. EPA conducted NHEXAS phase I (pilot) surveys in Arizona, Maryland, and EPA's region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin). In the Region 5 and Baltimore studies, analytes (in urine and blood) included chlordane, dieldrin, 4,4'-DDE, -DDD, and -DDT. In addition, the Region 5 survey included a Children's Pesticide Exposure Study (CPES) in Illinois, Ohio, Indiana, Michigan, Minnesota, and Wisconsin. Currently, EPA has completed most of the fieldwork for the NHEXAS phase I surveys and is now analyzing the results. Based on these results, EPA will finalize the scope and methods for NHEXAS phases II and III. Additional information on NHEXAS is available on the internet at: http://www.epa.gov/nerl/nhexas.htm.

### Multi-media Monitoring

- **Toxics Release Inventory.** Under the Emergency Planning and Community Right-to-Know Act (EPCRA), facilities that are in certain industry sectors, that have 10 or more full-time employees, and that manufacture, process or otherwise use certain toxic chemicals in amounts greater than the regulatory threshold quantity are required to report releases of the toxic chemicals to EPA's Toxic Release Inventory (TRI). Only three of the Level 1 PBT pesticides – aldrin, chlordane, and toxaphene – are subject to the TRI requirements. The Level 1 PBT pesticides are no longer manufactured or processed in the U.S., although they are "otherwise used" because the "otherwise use" definition includes disposal, stabilization and treatment for destruction if the facility that conducts these activities received the toxic chemical for purposes of waste management. The industry sectors subject to the TRI reporting requirements include commercial hazardous waste treatment facilities that are regulated under RCRA Subtitle C (the Federal hazardous waste standards). An amendment to TRI was finalized by EPA on October 29, 1999, which established lower reporting thresholds for several PBT chemicals, including aldrin (100 pounds), chlordane (10 pounds) and toxaphene (10 pounds) (64FR 58665). Therefore, in the future EPA will receive reports of releases of these three pesticides from commercial waste treatment facilities that: (1) are regulated under RCRA Subtitle C; (2) have 10 or more full time employees; and (3) receive at least 100 pounds of aldrin, 10 pounds of chlordane, or 10 pounds of toxaphene for treatment (disposal) per calendar year.

- **Arctic Monitoring Assessment Program (AMAP).** As described above, AMAP includes monitoring and assessment of the ecological and human health effects of anthropogenic pollutants (including DDT and chlordane) in all compartments of the Arctic environment, including: air, snow, rain, ice, water, sediments, soils, biota, and humans.

## 7.0 PROPOSED GOALS AND ACTIONS

### 7.1 EPA'S ASSESSMENT AND STRATEGIC APPROACH

In the U.S., uses of the Level 1 pesticides have been canceled, production facilities have been closed, and intentional releases have been effectively controlled. However, despite the strong regulatory controls, current research indicates that human and ecological health risks continue to exist from exposure to the Level 1 pesticides. Available data gathered in current multi-media monitoring efforts provide evidence that the Level 1 pesticides are ubiquitous in the environment, and at concentrations sufficient to warrant exposure reduction actions as well as actions that target reductions in reservoir sources. Evidence also suggests that there are significant stocks of unused Level 1 pesticides remaining in the U.S. and overseas. Because the potential for accidental release from these stocks exists, the encouragement of activities which reduce existing stocks of unused Level 1 pesticides is also warranted. Current research indicates that international sources may also be contributing to air deposition through long-range transport to environmental contamination in the United States; therefore, efforts to encourage international phase-out of the use of the Level 1 pesticides also should continue.

Unlike some of the other Level 1 PBT substances, the Level 1 pesticides were all at one time, and still are in some countries, intentionally produced products. Because intentional releases of the Level 1 pesticides have been controlled and they are not generated as unwanted byproducts of certain manufacturing or combustion processes, the strategic approach of this action plan significantly differs from other PBT action plans. The continued presence and cycling of these pesticides in the environment where use has long been discontinued, and their widespread distribution even in areas where no previous use has occurred, is the result of their long persistence in various environmental media and high potential for bioaccumulation, as well as their accidental release from unused product stocks and continued use internationally. Therefore, to address these remaining risks, the strategic approach of the Agency will be to:

1. Facilitate, encourage, and support states, tribes and local governments in their programs to collect and properly dispose of unwanted pesticides, including stocks of Level 1 pesticides.

2. Facilitate, to the extent possible, the remediation or containment of non-point and reservoir sources, including sediments, contaminated industrial sites, agricultural chemical dealer/storage sites, and past use sites on a priority basis.

3. Seek Level 1 pesticide exposure reduction, especially for highly exposed and sensitive populations, through public education, fish advisories, and other outreach.
4. Eliminate risks from the long-range transport (LRT) of these substances by working internationally to phase-out their production and use and to encourage environmentally sound management, disposal and/or destruction of stockpiles of these chemicals in other countries.

5. Conduct continued monitoring of the Level 1 pesticides in all relevant environmental media, fish and wildlife, and humans. Use monitoring results to provide information regarding continuing and emerging problems created by the presence of these substances, and as the basis for measuring progress.

The strategic approach is illustrated in Table 7-1 below.

**Table 7-1. The Five Key Elements of the Pesticide Strategic Approach Address Prevention of Pesticide Releases Through Management of Old Pesticide Stocks, Management of Contaminated Environments, International Coordination, Human Exposure Reduction Through Education and Outreach, and Continued Monitoring**

| National Level 1 Pesticides Strategy | | |
|---|---|---|
| **Strategic Approach** | **Key Players** | **Result** |
| Facilitate, encourage, and support waste pesticide collection programs | OPP, Regions, States, Tribes, Other Federal Agencies, OSWER | Prevention of new releases of Level 1 pesticides<br><br>Proper disposal of Level 1 pesticide stocks |
| Facilitate the remediation or containment of non-point sources, reservoirs, and other contaminated sites on a priority basis | OW, OPPT, OSWER | Targeted remediation of pesticide contamination in the environment<br><br>Reduction in pesticide levels in humans and wildlife |
| Seek exposure reductions through education and outreach | Regions, OW, OPPT, States, Tribes, Other Federal Agencies | Reduction in pesticide levels in humans |
| Work internationally to phase-out production and use of the Level 1 pesticides and encourage environmentally sound management, disposal and/or destruction of stockpiles in other countries | OIA, OAR, GLNPO | Reduction of long-range transport of pesticides<br><br>Reduction in pesticide levels in humans and wildlife |
| Conduct continued monitoring of the Level 1 pesticides in all relevant environmental media, fish and wildlife, and humans. | ORD, GLNPO, OW | Identification of continuing and emerging problems<br><br>Measurement of progress towards achieving reductions and meeting PBT goals |

The Agency's specific strategy for addressing reservoir sources and for monitoring environmental pollutants will not be limited to a focus only on the Level 1 pesticides. Rather it will be part of a part of broader Agency and other Federal efforts, including:

- The Agency-wide Contaminated Sediment Management strategy, which utilizes a cross-program policy framework to promote consideration and reduction of ecological and human health risks posed by sediment contamination. The strategy advocates a watershed approach to managing existing sediment contamination and preventing future contamination.

- The Agency's CERCLA and RCRA programs to manage current and abandoned contaminated industrial sites.

- Ongoing monitoring efforts in relevant environmental media, biota, and humans (such as the Integrated Atmospheric Deposition Network, USGS's National Water Quality Assessment, EPA's National Study of Chemical Residues in Fish, and CDC's National Health and Nutrition Examination Surveys). The vigilance of monitoring programs to record progress, and to alert us to continuing and emerging problems created by the presence of these substances will continue.

- Agency research into the sources and pathways of human exposure, particularly children's exposure, to toxic pollutants.

## 7.2 GOALS

### 7.2.1 Relevant Government Performance and Results Act of 1993 (GPRA) Goals

The goal of the PBT Strategy, to identify and further reduce risks to human health and the environment from existing and future exposure to PBTs, is the guiding principle in the development of the strategic approaches for the Level 1 pesticides in this action plan. In addition, this action plan supports several goals outlined in EPA's 1997 Five Year Strategic Plan. As required under the Government Performance and Results Act of 1993 (GPRA), EPA's Strategic Plan describes EPA's mission and sets forth ten major goals that serve as the framework for the Agency's planning and resource allocation decisions. These ten goals apply to all of EPA's programs and projects and, therefore, clearly encompass many goals, targets and programs that do not apply to the Level 1 pesticides. There are, however, several GPRA goals and sub-objectives that do call for programs promoting reductions in the environmental presence of all toxics of concern, and thus effectively contribute to the desired outcome of pesticide exposure risk reduction. These broader GPRA goals that are relevant to the Level 1 pesticides and the associated strategy described in this report are listed in Appendix E. GPRA objectives in EPA's 1997 Strategic Plan are currently in the process of being revised in the Draft 2000 Strategic Plan, and therefore, some goals relevant to the Level 1 pesticides may change. Revised objectives in the Draft 2000 Strategic Plan are now undergoing external review separate from this Draft Action Plan for the Level 1 pesticides.

### 7.2.2 Goals for the Level 1 Pesticides

In addition to the goals of the EPA Strategic Plan, the Agency has established for this action plan the following goals specific to the Level 1 pesticides. These goals recognize that production, use, and intentional release of the Level 1 pesticides in the United States has been effectively controlled, but that accidental release and current environmental contamination may still pose risks to human health and the environment. Therefore, the Agency will work in collaboration with its federal partners and other stakeholders, to achieve the following goals:

- Facilitate, encourage and support states, tribes and local governments in their programs to collect and properly dispose of unwanted pesticides, including stocks of the Level 1 pesticides.

- Facilitate, encourage, and support the proper disposal of stocks of the Level 1 pesticides at federal facilities in the United States,

- Contain or remediate Level 1 pesticide releases from non-point and reservoir sources such as contaminated sediments, industrial sites, agricultural chemical dealer/storage sites, and past use sites.

- Reduce the atmospheric transport of Level 1 pesticides by eliminating production and use and promoting environmentally sound management, disposal or destruction internationally, taking into account related health and environmental concerns in other countries.

- Continue monitoring of Level 1 pesticides in the environment and in humans, until concentrations in human populations have been reduced and negative impacts on ecological health and beneficial use of water resources have been eliminated.

## 7.3 STAKEHOLDER INVOLVEMENT

EPA considers stakeholder involvement essential to reaching the goals of the PBT Strategy. EPA will seek stakeholder input and invite comment on this draft national plan, as well as encourage all interested partners to join in implementing the key actions contained in this plan to reduce risks to human health and the environment from exposure to Level 1 pesticides. During the development of this action plan, several industry, non-governmental, and environmental groups reviewed a preliminary draft of the Level 1 pesticides action plan and provided valuable comments. EPA has carefully reviewed those comments and incorporated them, as possible, into this draft for public review. EPA will continue to work with all of its stakeholders, both in the finalization and the implementation of this action plan. Stakeholder involvement will build upon the Great Lakes Binational Toxics Strategy (BNS) Pesticides work group as a starting point and will expand to include representatives nationwide. Stakeholder participation will be especially pertinent to Clean Sweeps and public outreach and education including fish advisories.

The Agency is currently soliciting public comment and information or data on the following topics and issues related to the PBT pesticides (Level 1):

- quantities of domestic unused stocks of pesticide products;
- historical trends or current soil residue levels (urban and agricultural);
- information on sites with significant Level 1 pesticide contamination that have not been identified in Appendix D;

- current levels of pesticides (used in residences) in indoor environments;
- alternative disposal and soil/sediment remediation methods, and performance information;
- other sensitive or highly exposed human subpopulations;
- meaningful and feasible ways to address the problem of canceled pesticides in the environment;
- meaningful PBT goals, performance measures, and timeframes for such accomplishments.

## 7.4 FUTURE DIRECTIONS AND ACTIVITIES

The following sections outline proposed actions specifically aimed at reducing risk associated with current and future exposure to Level 1 pesticides, but which will in some cases also aid in reducing human exposures to other priority PBT pollutants.

### 7.4.1 Pesticide Collection Programs

**Actions Relating to Domestic Pesticide Collection**. The continuation of Clean Sweep collections has been clearly justified, as significant amounts continue to be collected each year by states involved in such activities as discussed in sections 5.2.1 and 6.2.1. Despite some limitations of the currently available data, there is a clear indication that the Clean Sweeps Programs have reduced existing stocks of the Level 1 pesticides, and in addition, have prevented significant increases in environmental contamination, had such quantities of pesticides been released.

However, as discussed in section 5.2.1, there is a substantial indication that there is still a large (but unquantified) amount of pesticides still "out there". In addition, many Clean Sweeps programs may only currently be conducted on an intermittent or limited basis due to the lack of consistent funding. Therefore, while past Clean Sweep collections represent solid accomplishments of states and local governments, evidence supports not only the existence of a continuing need to collect and properly dispose of accumulated pesticides, but also a need to expand and better coordinate current Clean Sweeps efforts and to establish long-term, comprehensive programs.

Recognizing that the remaining waste stocks of Level 1 pesticides in the U.S. potentially represent the primary domestic source of new Level 1 pesticide release, the following activities will help to address this contamination threat. EPA will specifically support states, tribes and local governments in their pesticide collection and disposal efforts by activities such as:

- **Continuing to supply technical assistance**, as described in section 6.2.1. For example, EPA will continue to provide technical assistance to pesticide collection program managers by such activities as collecting, consolidating and disseminating information about Clean Sweep programs. Additionally, once EPA finishes the report on the status and success of Clean Sweep programs, it will be distributed and posted on the EPA website as an easily-accessible source of information.

- **Helping to resolve regulatory issues and barriers**. One logistical obstacle often mentioned by Clean Sweep program managers is that the one incinerator in the U.S. that is permitted for dioxin-containing waste has been accepting dioxin wastes on an inconsistent and unpredictable basis over the past few years. Program managers don't want to accept dioxin-containing pesticides at Clean Sweep events if the state has to pay for storage until a disposal option becomes available at some uncertain point in the future. However, rejecting certain pesticides at events can disrupt the smooth operation of Clean Sweeps, because farmers may lose their motivation for participating if the program seems to have arbitrary rules or if they can't completely purge their storage areas. Even though none of the PBT pesticides contain dioxin, this issue is relevant to the long-term viability of Clean Sweep programs in general.

  Other regulatory issues that have been raised as obstacles are: certain RCRA requirements for hazardous waste generators (e.g., manifests, limited storage times, and obtaining a generator identification number); not adopting the Universal Waste Rule (which provides regulatory relief from some of the RCRA requirements for certain wastes); different interpretations of the Universal Waste Rule; and the Department of Transportation Hazardous Materials Regulations.

  The states and local governments with comprehensive, permanently-funded programs have found ways to minimize or alleviate these regulatory issues, but EPA may be able to facilitate Clean Sweeps in other states, tribes and local governments by addressing these potential barriers. Facilitation might incude:

  - In light of the potential safety benefits of successful Level 1 pesticide collection, the Agency will consider means for encouraging states and local governments to adopt policies that, where possible, minimize potential liability of the pesticide holder under RCRA hazardous waste generator rules. Adoption of such amnesty policies will help States to build trust with pesticide holders.
  - The Universal Waste Rule is an alternative set of management standards in lieu of hazardous waste regulations under 40 CFR Parts 260-272 (standards applicable to generators of hazardous waste, storage and disposal facilities, etc), and in effect, can serve as a regulatory relief mechanism. The Universal Waste Rule may be implemented by RCRA authorized states, but where there is no state RCRA authorization in place then the federal regulations are implemented. EPA will promote understanding and adoption of the Universal Waste Rule.

- **Helping states, tribes, and local governments identify options for financing Clean Sweep programs**. EPA will consider activities such as the preparation of resource materials to describe how states with comprehensive, long-term programs obtain funding, and the development of a clearinghouse of information on potential sources of funding. As an example, there is opportunity to coordinate Clean Sweeps with the Office of Water activities in fulfillment of the Clean Water Act (Section 303(d) list of impaired or threatened waters). Several states have used Clean Water Act Section 319 grant dollars (used to address nonpoint sources of pollution) to fund such programs. The Office of Water could identify Clean Sweeps as one tool that should be considered to address pesticide-impaired waters. Additionally, the list of waters impaired for Level 1 pesticides, or the generic "pesticides", could be used to target outreach efforts to States to encourage them to institute a "Clean Sweep" program in the watershed. The issue of funding is important because a major limiting factor for many of the states without comprehensive programs is the absence of a consistent funding mechanism.

! **Supporting Clean Sweep program outreach**. EPA will provide communication materials encouraging states and other governments to accept waste pesticides from households and businesses other than farms.

! **Facilitating the collection of pesticides from households and urban business.** EPA will support local governments, to the extent possible, in their household hazardous waste and small quantity generator waste collection and disposal programs. For example, as part of the Consumer Labeling Initiative EPA is developing label instructions that would direct the users of certain consumer pesticides to local household hazardous waste collection programs (if available) as an option for disposing of unwanted pesticides.

**DOD Coordination**. EPA can support federal facilities by working with the Department of Defense (DOD), Defense Reutilization and Marketing Service (DRMS). EPA's Office of Pesticide Programs is considering the potential for coordination with the DRMS to publicize the procedure currently being developed to allow non-DOD Federal agencies to use this disposal system for their own disposal needs on a reimbursable basis, with the goals of maximizing the participation of non-DOD Federal agencies and facilitating the disposal of Federally-held PBT pesticides. This could facilitate the disposal of PBT pesticides that may currently be stored at Federal facilities at a reasonable cost and using an existing system.

### 7.4.2 Reservoir and Non-point Source Reduction and Remediation Activities

In the process of conducting reservoir and non-point source reduction and remediation activities, the Agency will give full consideration to media-transfer issues, such as the possible release of Level 1 pesticides to the atmosphere through volatilization, e.g., in the drying of dredged sediments, or disturbance of contaminated soils. Recognizing that past environmental contamination and continued multi-media cycling are remaining sources of food chain contamination and other human exposures to the Level 1 pesticides, the following activities directed at reservoir sources will help to address this important exposure pathway.

**Actions Related to Sediments**. As discussed in section 6.2.4 the baseline activities section, the Agency currently addresses sediments as part of a broad Contaminated Sediment Management Strategy, which focuses on a wide range of environmental pollutants, including the Level 1 pesticides.

Within the context of the agency-wide strategy for contaminated sediments, the Agency will also pursue other activities to streamline and expedite remediation of Level 1 pesticide contamination. These actions include development of guidance documents on sediment remediation and coordination of disposal approval with states.

The Agency will utilize the sediment database maintained by the Office of Water/OST and conduct research, as discussed in section 6.2.4, to identify sediment remediation techniques/technologies and set appropriate clean-up targets or thresholds for the Level 1 pesticides in sediments. Other resources to be used in this action include efforts under the BNS program, including the 5-year Assessment and Remediation of Contaminated Sediments (ARCS) program, and sediment cleanup activities and remediation plans in the Great Lakes Areas of Concern and other contaminated sites.

Finally, the Agency will utilize sediment strategies outlined in the Clean Water Action Plan, which includes a key action item that reads "EPA will initiate place-based contaminated sediment recovery demonstration projects in five watersheds selected from those identified in EPA's National Inventory of Sediment Quality as being of the greatest concern. Remediation efforts will be coordinated with federal natural resource trustees." Candidate projects are primarily oriented toward demonstrating the success of various types of projects. Although this was not funded in FY1999 and is not an item that is part of base funding, OW will request FY2000 funding *[update needed]*.

**Actions Related to Land**. Although the Level 1 pesticides are found throughout U.S. agricultural soils, Agency efforts regarding contaminated soils will primarily focus on the continuation of programs, including RCRA corrective actions and Superfund cleanups, that address severely contaminated, localized sites. The lower priority for ambient contamination is because of limited solutions available to address diffuse contamination of widespread agricultural soils, as well as the much greater level of concern associated with heavily contaminated sites relative to pesticide residues from past agricultural use.

As discussed in Section 6.2.2 on baseline activities, the Agency currently addresses contaminated industrial sites as part of several broad Agency programs focused on a wide range of environmental pollutants, which include the Level 1 pesticides.

### 7.4.3 Dietary Exposure Reduction Activities

The environmental monitoring data summarized in previous sections, as well as the continued incidence of fish consumption advisories, all indicate that people still have the potential to be exposed to Level 1 pesticides. The extent, persistence, and bioaccumulation of the Level 1 pesticides in the environment, coupled with the difficulty of remediating current environmental levels, requires that the Agency focus not only on source reduction, but also on exposure reduction for these substances. Recognizing that the consumption of contaminated fish is currently considered a primary route of human exposure, the Agency will continue to promote exposure reduction through public outreach with a focus on fish consumption advisories. This is consistent with EPA's GPRA Goal 2 in the Agency's 1997 Strategic Plan ". . .consumption of contaminated fish will be reduced. . ." Specific efforts will include continued support and strengthening of the states' and tribes' fish advisory programs.

Although EPA recognizes that certain populations have the potential to be at a greater risk due to Level 1 pesticide exposure, current information is largely insufficient to target specific populations for dietary exposure reduction activities. Therefore, until better information is available to direct targeted exposure reduction efforts, the Agency will primarily continue to direct outreach efforts toward the general population, with the assumption that they will help to reduce exposure risk for all populations. This issue will begin to be addressed in the March 2001 workshop planned by EPA to better identify and develop effective risk communication methods for reaching ethnically and economically diverse populations.

In the event that research studies uncover additional significant exposure pathways, the Agency will also consider other exposure reduction activities, as appropriate. Information obtained in the Children's Total Exposure to Persistent Pesticides (CTEPP) study on how and to what extent children are exposed to the Level 1 pesticides and other PBTs will be used to guide exposure reduction and environmental remediation activities and to determine what additional steps may be needed to protect young children.

**Fish Consumption Advisory Programs**. The Agency will increase facilitation of State and Tribal development and implementation of monitoring programs and risk-based fish and wildlife advisory programs. Although there are numerous state fish advisories for pesticides, many states do not have comprehensive, or any, monitoring programs. Several states also do not use risk-based approaches for setting advisories. The variances among States that do have advisories often create confusion, especially on shared water bodies. As a result, people are consuming contaminated fish who might not otherwise do so, or who might be adversely affected because they have not been warned (i.e., pregnant or nursing women). Specific exposure reduction efforts that will be conducted under the Fish Advisory program include:

Work with State, Federal, and Tribal Agencies to Ensure Adoption of Consistent Methods for Developing and Communicating Fish Consumption Advisories. EPA will continue to provide assistance to States and tribes in establishing programs consistent with our National Guidance for States and Tribes on all aspects of how to establish a fully-protective fish consumption advisory program. If, after consultation with a State or Tribe, an appropriate advisory is not issued, EPA will issue fish or wildlife consumption advisories. EPA will continue to routinely revise and update the National Guidance materials.

Outreach Brochures for Fish Consumption Advisories. EPA will continue to work with ATSDR to develop and distribute a tool kit which will provide additional information for nurses and physicians to use when talking to patients about the risks associated with contaminants in fish.

User-Friendly Fish and Wildlife Consumption Advisories. The Agency will also attempt to increase education regarding risks associated with the consumption of pesticide-containing fish by keeping the National Listing of Fish and Wildlife Advisories (NLFWA) database up-to-date, and available on the web site as quickly as States and Tribes update the information.

### 7.4.4 International Activities

On an international level, negotiations towards a POPs convention show that some countries still use some POPs pesticides and may seek use exemptions, with some seeking alternatives pending financial and technical assistance. Some malarious countries, in consultation with the WHO, have determined a continued need to use DDT for vector control, although there is also strong support in these countries for eventual phase-out of DDT when affordable alternatives are in place. Several countries are undertaking programs to reduce their use of DDT and find feasible alternatives for malaria control. DDT is now manufactured only in India and China. Some countries are still producing chlordane for termite and fire ant control. Internationally, the UN Food and Agricultural Organization (FAO) has warned that risks from stockpiled pesticides are quite common in developing countries and estimates that large quantities of unused pesticides remain in foreign countries. All of these situations exemplify the importance of continued U.S. coordination with the international community on the issue of Level 1 pesticide reduction.

**Actions Relating to Pesticide Products in Other Countries**. The Agency strategy for addressing pesticides in other countries will primarily be done in coordination with several international efforts currently underway. Goals are to better understand quantities of pesticides remaining internationally, and to create an international framework within which reductions in global use and stocks of these substances can be achieved. Existing international efforts relating to pesticide use (previously described in section 6.2.1) that the Agency will continue to work on and coordinate with, include:

- United Nations Environmental Program (UNEP) Global Treaty on Persistent Organic Pollutants
- United Nations Environmental Program and Food and Agriculture Organization (FAO) Prior Informed Consent Procedure
- United Nations Food and Agriculture Organization International Obsolete Pesticides Program
- OECD-FAO-UNEP Workshop on Obsolete Pesticides.
- United Nations Economic Commission for Europe (UN ECE) Convention on Long-Range Transboundary Air Pollution (LRTAP) Protocol on Persistent Organic Pollutants

- North American Commission for Environmental Cooperation (CEC), Sound Management of Chemicals Program, Regional Action Plans for Chlordane and DDT
- North American Free Trade Agreement Technical Working Group on Pesticides
- World Health Organization's DDT Phase-Out Activities
- EPA International Training Module: Pesticide Disposal in Developing Countries

The Agency will continue to provide technical and advisory support for FAO efforts to facilitate proper disposal of obsolete pesticides in developing countries. FAO is currently in the process of negotiating possible future pesticide collections.

**Actions Related to Long Range Transport**. The Agency strategy for assessing Long Range Transport (LRT) and addressing non-domestic atmospheric sources of the Level 1 pesticides will also be done in coordination with several international efforts currently underway. Goals are to better understand the effects of LRT and to create an international framework within which reductions in global transport of these substances can be achieved. Existing international efforts relating to LRT (previously described in section 6.2.3) that the Agency will continue to coordinate with, include:

- UNEP Global Treaty on Persistent Organic Pollutants
- UN ECE Convention on Long-Range Transboundary Air Pollution (LRTAP), Protocol on Persistent Organic Pollutants
- Binational Toxics Strategy (BNS)

The Agency will work closely with the CEC, which has examined the issue of LRT in a 1997 document called "Continental Pollutant Pathways." In that report the CEC notes the sparsity of data related to atmospheric trends and conditions, due in large part to the fact that most monitoring networks have been established to determine local ambient concentrations and therefore are located in and around cities and at, or close to, ground level. The Agency will support CEC efforts to measure, monitor, model and assess the status and trends of chemicals, including the Level 1 pesticides, in the North American environment in conjunction with the CEC air program. Expected outcomes include (a) the preparation of a concept paper on monitoring, modeling, and assessment, (b) a workshop involving experts in those fields, and (c) preparation of an initial scoping paper on the nature, extent and significance of marine and freshwater ecosystems in the transport and cycling of persistent, bioaccumulative and toxic substances.

### 7.4.5 Monitoring Efforts

In addition to focusing on source and exposure reduction, the Agency will continue, as possible, to monitor the Level 1 pesticides in all relevant environmental media, fish and wildlife, and humans. Best available environmental monitoring data and routine assessment of Level 1 pesticide concentrations in human populations will be used both to measure success in reducing levels of the canceled pesticides in the environment, and to identify any continuing or emerging problems. In addition, monitoring efforts may aid in the identification of sensitive populations and geographic areas, as well as in deciding whether additional steps are necessary to protect sensitive sub-populations.

EPA will also consider options for additional monitoring to fill in information gaps such as potential long range sources (e.g., Asia) and other cross-border atmospheric transport of the Level 1 pesticides (e.g., Mexico-U.S. border). Recognizing that the need for a means to thoroughly evaluate Agency progress on achieving PBT goals has been identified by the PBT Plenary group as one of the top cross-cutting issues within the PBT program, EPA is also considering the potential development of a national monitoring strategy for all PBTs. Further supporting this need, a recent report from the U.S. General Accounting Office (GAO, May 2000) concluded that far more research is needed to understand human exposures to potentially dangerous chemicals, particularly for those who may be at most risk.

Although only certain of the Level 1 pesticides may be monitored in a particular program listed below, the primary existing environmental monitoring programs which will be used include:

**Air Monitoring**

- Integrated Atmospheric Deposition Network.

**Water and Sediments Monitoring**

- USGS's National Water Quality Assessment Program.
- EPA's National Sediments Database.
- State Lists of Impaired Waters.

**Monitoring of Biota / Biological Indicators**

- NOAA's National Status and Trends Program (Mussel Watch and Benthic Surveillance).
- EPA's National Study of Chemical Residues in Fish.

**Food Monitoring**

- FDA Monitoring Data for Pesticides on Food and Feed Commodities.
- USDA's Pesticide Data Program

**Monitoring of Human Body Burdens**

- CDC's National Health and Nutrition Examination Surveys
- National Human Exposure Assessment Survey
- Arctic Monitoring and Assessment Program (Body Burden Monitoring)

**Multimedia Monitoring**

- Arctic Monitoring and Assessment Program (atmospheric, terrestrial, and marine environment monitoring)
- Toxics Release Inventory.

The Level 1 pesticides will be monitored, as possible, in all of these efforts, and used as a leading indicator of the success of Agency remediation efforts directed at reducing current levels of all toxic pollutants in the environment.

#### 7.4.6 Actions Considered but not Able to be Implemented Due to a Lack of Resources

Due to the limited availability of Agency resources, it was necessary to prioritize the actions considered in the development of this action plan. As a result, some actions were not designated as high priority actions within the constraints of current Agency resources even though they were considered to be worthwhile and/or necessary endeavors. Some of these activities, which may be considered for future action or possible non-EPA support, are listed below:

- **Soil emission inventories**. Historically, most PBT pesticides, such as toxaphene and DDT, were applied to plants to control pests and can still be found in soils across the US. It would be helpful to have a better understanding of soils as a domestic source of emissions of PBTs compared to inputs from international sources.

- **Atmospheric monitoring data.** When negotiating and implementing international treaties, it is important to understand the extent to which long range transport of pesticides from other countries contributes to deposition in the United States. Additional monitoring data would be useful to help in distinguishing between U.S. and international sources. For example, it would be useful to have monitoring stations at all of our borders to better determine levels of PBTs originating from other countries or regions of the world being transported and deposited in the U.S.. Monitoring is essential, especially to provide data for model evaluation. For long-range transport work, it is useful to have monitoring in rural areas -- relatively far from strong sources -- as one cannot easily combine urban spatial scales (e.g., meters) with global spatial scales (e.g., 1000's of kilometers) in the same modeling effort.

- **Atmospheric emission inventories.** Substantial additional resources are needed to develop, enhance, and correct existing emissions inventories. Improved geographically and temporally resolved emissions inventories are needed for each PBT substance of concern, as they serve as the basis of any policy development. Although difficult to obtain, global emissions inventories are also useful for evaluating the sources of PBTs from outside the United States.

- **Evaluation of FDA Action Levels.** The Federal Drug Administration sets “action levels,” or amounts of pesticides that can be ingested with food and not result in adverse health effects in the general population. FDA sets these numbers based on risk information supplied by EPA, and consumption assumptions derived from dietary surveys done by the Department of Health and Human Services. FDA’s action levels for the Level 1 pesticides have not been reviewed or revised for many years, and may not reflect the most current understanding of these chemicals. This is potentially of concern to the immediate consumers of food contaminated by these pesticides, but is also of concern because some States use the FDA action levels to set local fish consumption advisories. Through letters to all states, promulgated guidance documents, and annual seminars, this practice has been discouraged by EPA and FDA in favor of a risk-based approach to derive local fish consumption advisories. However, some states continue to misuse the action level in this way. Therefore, it may be useful for EPA to update relevant risk information and, if warranted, recommend that FDA consider revising action levels for the Level 1 pesticides so that appropriate protection is assured until virtual elimination of these canceled pesticides is achieved.

- **Other Exposure Reduction Activities.** The Agency should also consider providing the public with information on the risks of exposure and current data on other exposure pathways such as other food sources, breast milk, placental transfer, etc., as research elucidates the significant of these pathways.

- **Pesticide Use Research and Monitoring / Improved Domestic Production Database.** The EPA domestic pesticide production data base should be improved. Currently, the data has a high error rate, relates to products rather than active ingredients, and tends to be several years old. The system itself should be automated, and modified so that it can generate reports directly responsive to inquiries. With modifications and improvements, the system could be an invaluable source for information about: production, export, and export destination; precise estimates of quantities remaining at the time of cancellation actions and their location.

### 7.4.7 Measures of Progress

The PBT Strategy requires that EPA follow several guiding principles, including the use of measurable goals and objectives and the assessment of performance. These principles coincide with EPA's Strategic Plan, as specified under the GPRA for all federal agencies, which requires the Agency to define measurable goals and objectives, measure progress, and report accomplishments. As stated in the PBT Strategy, EPA will use the following measures to track progress in reducing risks from pesticides: (1) environmental or human health indicators, (2) chemical release, waste generation, or use indicators, or (3) programmatic output measures.

In general, measures of progress for this action plan will focus on successful continuation of waste pesticide collection, successful remediation of contaminated sites, international agreements and implementation, and broad environmental monitoring programs. The environmental monitoring programs which will provide the data by which to measure continued reductions of the Level 1 pesticides in the environment were discussed previously in Sections 6 and 7.4.5. Specifically, the Agency will gauge the success of the strategic actions for Level 1 pesticide risk reduction according to the measures described in Table 7-2.

**Table 7-2. Measures of Progress for Strategic Action Directed at the Level 1 Pesticides**

| Strategic Approach | Environment or Human Health Indicators | Source Management and Programmatic Output Indicators |
|---|---|---|
| Facilitate, encourage, and support waste pesticide collection programs | ! Fish advisories and water quality indicators<br>! Reduction of pesticide levels in wildlife and humans[1] | ! Amounts of pesticides collected<br>! Throughput at disposal facilities<br>! Decrease in accidental releases<br>! Increase in number of States and Tribes with Clean Sweeps programs<br>! Grants issued |
| Facilitate the remediation of non-point sources, reservoirs, and other contaminated sites on a priority basis | ! Fish advisories and water quality indicators<br>! Pesticide levels in wildlife and humans[1] | ! Amounts of pesticide-contaminated substrates removed and disposed<br>! Reduction of NPL/CERCLA sites and Areas of Concern (AOCs) |
| Seek Exposure Reductions through education and outreach | ! Fish advisories and other water quality indicators<br>! Pesticide levels in humans[1] | ! Increase in number of States and Tribes with fish tissue monitoring programs and risk-based fish and wildlife consumption advisory programs |
| Coordinate with the international community to monitor and reduce LRT | ! Atmospheric levels of transport<br>! Pesticide levels in wildlife and humans[1] | ! Implementation of international monitoring and research efforts<br>! International agreements signed and implemented |
| Conduct continued monitoring of the Level 1 pesticides in all relevant environmental media, fish and wildlife, and humans. | | ! Identification of continuing and emerging problems<br>! Measurement of progress towards achieving reductions and meeting PBT goals |

[1] Human body burdens will be measured by pesticide levels in blood/serum (e.g., NHANES). The Fish Tissue Survey will be used to assess pesticide levels in wildlife.

### 7.4.8 Actions with links to other PBT chemicals

**Effect on Other Chemicals and Integration with Other PBT Action Plans.** The purpose of the following section is to address opportunities or problems related to other chemical substances that arise from actions proposed in this plan for the Level 1 pesticides. This includes such issues as:

1. Opportunities for resource and cost efficiencies in addressing sources or sectors that are associated with the Level 1 pesticides as well as other toxic chemicals besides the Level 1 pesticides. This involves coordinated efforts directed at achieving reductions in multiple pollutants, including the canceled pesticides, and integration with other PBT action plans.

2. Impact of the actions recommended in this plan on the use or emission of other toxic substances. This includes consideration of any negative environmental impacts resulting from the collection, storage, or disposal of the Level 1 pesticides.

With regard to the first issue, Agency actions directed at monitoring, addressing sediments, improving communication and outreach (especially with sensitive populations), and long range transport, discussed in previous sections, represent coordinated efforts to address a common source or pathway for many PBTs and other toxic substances. [*Comments and recommendations on potential integrated actions to be included in the action plan are solicited.*]

With regard to the second issue, the Agency is concerned about minimizing any potential negative impact related to the collection, storage, or disposal of Level 1 pesticides. The vast majority of pesticides collected at Clean Sweep and household hazardous waste collection programs – including all of the Level 1 pesticides – are incinerated at permitted incinerators. Some non-governmental organizations have expressed the opinion that this disposal method is unacceptable because it creates other PBT chemicals, such as dioxins and furans. These same parties believe that EPA should encourage the development and implementation of disposal technologies other than incineration. EPA's 1993 Strategy for Hazardous Waste Minimization and Combustion (http://www.epa.gov/epaoswer/hazwaste/combust/general/strat-2.txt) addresses these issues in the following goals for the role of combustion and alternative technologies: 1) Maintain appropriate role for combustion, and continue to ensure that combustion and other treatment facilities reduce toxicity, volume, and/or mobility of hazardous wastes in a manner that is protective of public health; and 2) Foster the commercial development and use of alternative treatment and other innovative technologies that are safe and effective in reducing the toxicity, volume, and/or mobility of RCRA industrial process and remediation wastes. As mentioned in section 7.4.1, one logistical obstacle faced by Clean Sweep program managers is that the one incinerator in the U.S. that is permitted for dioxin-containing waste has been accepting dioxin wastes on an inconsistent and unpredictable basis over the past few years. Clearly, this issue is related to EPA's regulations and policies regarding dioxin, another Level 1 PBT substance.

[*Comments and recommendations on potential cross-cutting actions that should be addressed in the action plan are solicited.*]

# 8.0 REPORTING PROGRESS

*[reporting procedure to be developed]*

## LIST OF ACRONYMS

| | |
|---|---|
| AOC: | Area of Concern |
| ATSDR: | Agency for Toxic Substances and Disease Registry |
| BNS: | Great Lakes Binational Toxics Strategy |
| CAA: | Clean Air Act |
| CDC: | Center's for Disease Control and Prevention |
| CEC | North American Commission for Environmental Cooperation |
| CERCLA: | Comprehensive Environmental Response, Compensation, and Liability Act |
| CWA: | Clean Water Act |
| FAO: | UN Food and Agriculture Organization |
| FDA: | U.S. Food and Drug Administration |
| FIFRA: | Federal Insecticide, Fungicide, Rodenticide Act |
| FSIS: | Food Safety Inspection Service |
| GLNPO | Great Lakes National Program Office |
| GPRA | Government Performance and Results Act of 1993 |
| IADN: | Integrated Atmospheric Deposition Network |
| IJC: | International Joint Commission |
| LRTAP | UNECE Long-Range Transboundary Air Pollution (LRTAP) protocol |
| MCL: | Maximum Contaminant Level (Drinking water standard) |
| NAFTA | North American Free Trade Agreement |
| NHANES | National Health and Nutrition Examination Surveys |
| NLFWA: | National Listing of Fish and Wildlife Advisories |
| NPL: | National Priority List (Superfund) |
| OAQPS: | EPA's Office of Air Quality Planning and Standards |
| OIA: | Office of International Activities |
| OPP: | EPA's Office of Pesticide Programs |
| OPPT: | EPA's Office of Pollution Prevention and Toxic Substances |
| OPPTS: | EPA's Office of Prevention, Pesticides and Toxic Substances |
| ORD: | EPA's Office of Research and Development |
| OSWER: | EPA's Office of Solid Waste and Emergency Response |
| OW: | EPA's Office of Water |
| PBT: | Persistent Bioaccumulative Toxic |
| POP: | Persistent Organic Pollutant |
| RCRA: | Resource Conservation and Recovery Act |
| SARA/EPCRA: | Superfund Amendment Reauthorization Act /Emergency Planning and Community Right-to-know Act |
| SDWA: | Safe Drinking Water Act |
| SMOC: | Sound Management of Chemicals Initiative |
| TCLP: | Toxicity Characteristic Leachate Procedure |

| | |
|---|---|
| TMDL: | Total Maximum Daily Load |
| TRI: | Toxic Release Inventory |
| TSCA: | Toxic Substances Control Act |
| UNECE | United Nations Economic Commission for Europe |
| UNEP | United Nations Environment Program |

USDA:U.S. Department of Agriculture

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# APPENDIX A
# TEMPLATES OF SUPPORTING TABLES

## LIST OF KEY CONTACTS

| Name | Organization | Phone |
|---|---|---|
| Michael McDavit | USEPA/OPP | (703) 308-0325 |
| Mark Wilhite | USEPA/OPP | (703) 308-8586 |
| David Macarus | USEPA-Region 5/GLNPO | (312) 353-5814 |
| Paul Matthai | USEPA/OPPT | (202) 260-3385 |

# APPENDIX B
# CHEMICAL PROFILES

*Information included in these profiles was primarily drawn from the following three sources:*

U.S. Department of Health and Human Services, Public Health Service. 1999. Agency for Toxic Substances and Disease Registry Toxicological Profiles, CRC Press LLC.

U.S. Environmental Protection Agency. 2000. Great Lakes Binational Toxics Strategy: The Level 1 Pesticides in the Binational Strategy (*The Great Lakes Pesticides Report),* Final Draft. U.S. Environmental Protection Agency. March 1, 2000.

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## B.1 ALDRIN/DIELDRIN CHEMICAL PROFILE

### *Description*

Aldrin and dieldrin are similar compounds which were both used for crop protection against various soil dwelling pests as well as for termite infestation. Both were produced in the U.S. until 1974; current manufacture and use have been discontinued. Dieldrin is a primary degradation product of aldrin.

### *Sources and Sectors*

Known and suspected sources include:

- Atmospheric transport
- Contaminated soils from historical applications
- Contaminated building materials from termiticide application
- Hazardous waste sites associated with manufacture, transfer, or use

### *Exposure and Health Effects*

Humans are exposed to aldrin and dieldrin through water, food, and soil. Contaminated fish are a main source of exposure through food. Both aldrin and dieldrin are fat-soluble and will accumulate in the bodies of humans and animals. Aldrin is converted to dieldrin in the human body, which is then slowly excreted. Detectable levels of dieldrin were found in more than 80 percent of breast milk samples collected from 1,436 women in the United States (Savage et al., 1981 as cited by ATSDR). Possible short-term health effects include headache, dizziness, nausea, vomiting, irritability, confusion, ataxia, and general malaise. Large doses can cause death. Long-term health effects of both aldrin and dieldrin can include adverse neurological and behavioral effects**.**

In addition, dieldrin is thought to cause reproductive problems and is considered an endocrine disruptor. Both aldrin and dieldrin are probable human carcinogens. Recent studies have linked elevated exposure to dieldrin with breast cancer. Concentrations of dieldrin in the waters of the Great Lakes exceed EPA Water Quality Criteria for carcinogenic effects in humans and may pose a potential carcinogenic risk to humans through consumption of fish from these waters.

### *Sensitive Subpopulations and Geographic Areas*

Aldrin was used primarily in the northern Midwest and southeastern states. Dieldrin was used in western, southern, and northeastern states.

### *Environmental Impacts*

Dieldrin has been detected in all environmental media. Aldrin detections are much lower and less frequent, since it is converted rapidly to dieldrin through both chemical and biological processes. Concentrations of dieldrin in surface waters are generally higher than those of many of the other highly persistent organochlorine pesticides, primarily due to its greater preference for the water phase, relative to other compounds in this class. Aldrin and dieldrin, however, still tend to accumulate in biological tissues and are primarily detected as dieldrin. Dieldrin concentrations in fish have exhibited a general pattern of decline in the Great Lakes since the 1970s. Dieldrin has been detected in many remote locations, including the Arctic, indicating long range atmospheric transport.

Short-term exposures to aldrin have been associated with a variety of behavioral and physical effects, including tremors, convulsions, and seizures. Dieldrin results in similar effects, including convulsions, ataxia, dyspnea, and immobility. Long-term effects of dieldrin in mammals may include reproductive effects such as reduced litter size, reduced ovulation rate, and increased resorption of pregnancy.

### *Current Regulations and Programs*

Current regulations and programs targeting aldrin/dieldrin emissions are presented in Table 1.

**Table 1. Current Regulations and Programs**

| | CAA | CWA | FIFRA | RCRA | SARA / EPCRA | CERCLA |
|---|---|---|---|---|---|---|
| Standards and Regulations | No specific regulations targeting releases to air | §307/ CWA Priority: Listed as toxic and priority pollutants; subject to toxic pollutant effluent limitations (40CFR 129) which may be incorporated into any NPDES permit under §304(b) (40CFR 122) and/or general pretreatment (40CFR 403)<br><br>§304(a) Federal Water Quality Standards for Human Health (water and organism: 0.13 ng/L (aldrin) and 0.14 ng/L (dieldrin) | 1974 - All food crop pesticide uses canceled<br><br>1988 - Tolerances revoked<br><br>1989 - All remaining pesticide uses for dieldrin canceled<br><br>1991 - All remaining pesticide uses for aldrin canceled | Subtitle C: Aldrin/dieldrin-containing substances are classified acute hazardous wastes (261.33); subject to hazardous waste regulations<br><br>Universal treatment standards for aldrin/dieldrin levels in waste (40CFR 268.48) | §313: Releases of aldrin must be reported to TRI (40CFR 372.65)<br><br>(Jan. 5, 1999 Federal Register proposed reduction of TRI reporting threshold for aldrin to 100 lbs. per year (64FR 687)) | §103: Spills of aldrin or dieldrin >1 lb. must be reported to the National Response Center |

**Standards and Regulations**

**Great Lakes Initiative 1995 and Great Lakes Water Quality Agreement, 1987 (concentrations in ng/L)**

| | Aldrin | Dieldrin |
|---|---|---|
| Human Carcinogenic | NA | 0.0006 |
| Human Noncarcinogenic | NA | 0.41 |
| Aquatic Life | | |
| Acute | NA | 240 |
| Chronic | NA | 56 |
| Wildlife | NA | NA |

**Ambient Water Quality Criteria: AWQC (40CFR 131) (concentrations in ng/L)**

| | Aldrin | Dieldrin |
|---|---|---|
| Aquatic Life | | |
| Freshwater | 3000 | 1.9 |
| Saltwater | 1300 | 1.9 |
| Human Health (water and organism) | 0.13 | 0.14 |

**U.S. Food and Drug Administration Action Levels**

| | |
|---|---|
| Fish-fillet | sum of aldrin and dieldrin <0.3 mg/kg wet wt. |

| Table 1. Current Regulations and Programs | |
|---|---|
| **Policy and Programs** | – Binational Toxics Strategy (BNS) Level 1 substances<br>– International Joint Commission (IJC) Critical Pollutants<br>– Bioaccumulative Chemicals of Concern (BCC) under the Great Lakes Water Quality Guidance<br>– Tier I chemicals under the Canada-Ontario Agreement<br>– Recognized pollutants in Lakes Erie, Michigan, Ontario, and Superior Lakewide Management Plans (LaMPs)<br>– Targeted in Remedial Action Plans (RAPs): effort by IJC, EPA and other groups to restore beneficial uses to Areas of Concern (AOCs) in the Great Lakes<br>– Persistent Organic Pollutants (POP) by Commission for Environmental Cooperation (CEC) Council Resolution #95-5<br>– Included in the UN ECE Convention on Long-Range Transboundary Air Pollution (LRTAP) protocol<br>– Included in the North American Free Trade Agreement Technical Working Group on Pesticides<br>– Monitored by the Integrated Atmospheric Deposition Network (IADN) (dieldrin only)<br>– Included in CAA §112(m) program, Atmospheric Deposition to Great Lakes and Coastal Waters<br>– Found in a number of National Priorities List (NPL) hazardous waste sites<br>– Included in the National Water Quality Assessment (NAWQA) Program (dieldrin only)<br>– National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch Program<br>– Clean Sweeps Programs: Collection of remaining stores of aldrin/dieldrin |

CAA: Clean Air Act
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CWA: Clean Water Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
NPDES: National Pollutant Discharge Elimination System
RCRA: Resource Conservation and Recovery Act
SARA/EPCRA: Superfund Amendment Reauthorization Act / Emergency Planning and Community Right-to-know Act
TRI: Toxic Release Inventory

## B.2 CHLORDANE CHEMICAL PROFILE

### *Description*

Chlordane is a man-made pesticide sometimes referred to as Octachlor® or Velsicol 1068®. It was registered for use as a pesticide in the United States from 1948 to 1988, at which time pesticide uses were canceled due to concern over human cancer risk, evidence of human exposure and accumulation in body fat, environmental persistence, and danger to nonpest wildlife. Chlordane was originally used as a pesticide on field crops such as corn and citrus fruits and was later used to control termites in houses.

Chlordane is a thick, colorless to amber liquid with a mildly irritating smell. Technical chlordane is not a single chemical but a mixture of pure chlordane with more than 140 other related compounds.

### *Sources and Sectors*

All uses of chlordane in the United States were canceled by 1988. The sole manufacturer voluntarily ceased production and export in 1997. Therefore, ongoing sources to the environment are associated with historical applications and releases.

Known or suspected sources include:

- Contaminated building materials from termiticide application
- Soils to which chlordane was historically applied
- Hazardous waste sites associated with manufacture, transfer or use

### *Exposure and Health Effects*

A primary exposure route for chlordane is through contaminated food. Elevated concentrations of chlordane have been the cause of fish consumption advisories in many water bodies. Humans living in homes that were previously treated with chlordane to control termites may also be exposed.

Short-term acute exposure to chlordane may cause eye, nose, mouth and throat irritation, nausea, headaches, confusion, weakness, vision problems, diarrhea, abdominal pain, convulsions, unconsciousness and vomiting. Long-term exposure has been associated with liver and kidney damage, cancer and infertility. Chlordane has been classified as a probable human carcinogen based on studies in mice in which liver cancer was observed at concentrations of 30 to 64 mg/kg/day. Chlordane may also cause behavioral disorders in children who are exposed before birth or while being nursed.

### *Sensitive Subpopulations and Geographic Areas*

Because chlordane was primarily used to control termites, concentrations of the chemical are highest in the southeast portion of the country where termite infestations are a serious problem. An estimated 19.5 million structures were treated with chlordane in the United States. Those living or working in these structures today may be at the greatest risk for exposure.

### *Environmental Impacts*

Chlordane is found in all environmental media including air, soil, water, and sediment. In soils, it binds strongly to particles and is highly persistent, having been shown to remain for over 20 years. It is unlikely to enter groundwater, though it does volatilize from surface soils to some extent. Although the half-life of chlordane in the atmosphere is relatively short, it has been known to travel long distances and has been detected in remote locations such as the Arctic. Chlordane concentrations in air from homes that were previously treated for termite infestation have been found to be 10-1000 times higher than in ambient air, even years after treatment occurred.

In aquatic systems chlordane is typically bound to particles, although low levels of certain chlordane isomers have been detected in waters from the Great Lakes as well as urban harbors and bays. The ultimate fate of chlordane in lakes and oceans is in the bottom sediment. Chlordane also bioaccumulates in both marine and freshwater organisms. Long-term monitoring programs have indicated a decline of chlordane in fish from the mid-1970s through the early 1990s.

Chlordane has been demonstrated to be highly toxic to freshwater invertebrates, and fish. Chronic exposures to chlordane in the environment have been associated with a shortened lifespan, reproductive impairments, reduced fertility, and changes in the appearance or behavior of animals and birds. Chlordane has also been identified as an endocrine disruptor and may cause adverse reproductive or developmental effects.

### *Current Regulations and Programs*

Current regulations and programs targeting chlordane emissions are presented in Table 1.

**Table 1. Current Regulations and Programs**

Standards and Regulations

| CAA | CWA | FIFRA | RCRA | SARA / EPCRA | CERCLA |
|---|---|---|---|---|---|
| §112(b): Designated a HAP; subject to NESHAPS and compliance with MACT standards | CWA Priority: Listed as a priority pollutant (40CFR 423); subject to NPDES effluent limitations under §304(b) (40CFR 122) and general pretreatment (40CFR 403)<br><br>§304(a) Federal Water Quality Standards for Human Health (water and organism): 0.21 ng/L | 1978 – All use on food crops canceled<br><br>1988 – All sales and commercial use stopped | Subtitle C: Chlordane-containing substances are classified toxic hazardous wastes (261.33); subject to hazardous waste regulations and ground water monitoring requirements (40CFR 264)<br><br>Universal treatment standards for chlordane levels in waste (40CFR 268.48) | §313: Releases must be reported to TRI (40CFR 372.65)<br><br>(Jan. 5, 1999 Federal Register proposed reduction of TRI reporting threshold to 10 lbs. per year (64FR 687))<br><br>§302(a): Emergency planning required when present in quantities >1000 lbs. (40CFR 355) | §103: Spills of chlordane >1 lb. must be reported to the National Response Center |

**Great Lakes Initiative 1995 and Great Lakes Water Quality Agreement, 1987 (concentrations in ng/L)**

| | |
|---|---|
| Human Carcinogenic | 0.25 |
| Human Noncarcinogenic | 1.4 |
| Aquatic Life | |
| Acute | NA |
| Chronic | NA |
| Wildlife | NA |

**Ambient Water Quality Criteria: AWQC (40CFR 131) (concentrations in ng/L)**

| | |
|---|---|
| Aquatic Life | |
| Freshwater | 4.3 |
| Saltwater | 4 |
| Human Health (water and organism) | 0.21 |

**U.S. Food and Drug Administration Action Levels**

| | |
|---|---|
| Fish-fillet | NA |

| Table 1. Current Regulations and Programs | |
|---|---|
| Policy and Programs | – Binational Toxics Strategy (BNS) Level 1 substance<br>– Bioaccumulative Chemical of Concern (BCC) under the Great Lakes Water Quality Guidance<br>– Tier 1 chemical under the Canada-Ontario Agreement<br>– Recognized pollutant in Lakes Erie, Michigan, Ontario, and Superior Lakewide Management Plans (LaMPs)<br>– Targeted in Remedial Action Plans (RAPs): Effort by IJC, EPA and other groups to restore beneficial uses to Areas of Concern (AOCs) in the Great Lakes<br>– Persistent Organic Pollutant (POP) by Commission for Environmental Cooperation (CEC) Council Resolution #95-5<br>– in the UN ECE Convention on Long-Range Transboundary Air Pollution (LRTAP) protocol<br>– North American Regional Action Plan developed under CEC's Sound Management of Chemicals Program<br>– Included in the North American Free Trade Agreement Technical Working Group on Pesticides<br>– Targeted chemical in the Great Lakes Regional Air Toxic Emissions Inventory Project<br>– Included in the USEPA Cumulative Exposure Project<br>– Monitored by the Integrated Atmospheric Deposition Network (IADN)<br>– Included in CAA §112(m) program, Atmospheric Deposition to Great Lakes and Coastal Waters<br>– Found in a number of National Priorities List (NPL) hazardous waste sites<br>– Included in the National Water Quality Assessment (NAWQA) Program<br>– Cause of fish consumption advisories in the Great Lakes region<br>– National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch Program<br>– Council of Great Lakes Industry BNS Implementation: Search for information regarding the export, storage, and use of chemical intermediates of Level I pesticides<br>– Clean Sweeps Programs: Collection of remaining stores of chlordane |

CAA: Clean Air Act
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CWA: Clean Water Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
HAP: Hazardous Air Pollutant
MACT: Maximum Achievable Control Technology
NESHAPS: National Emissions Standards for Hazardous Air Pollutants
NPDES: National Pollutant Discharge Elimination System
RCRA: Resource Conservation and Recovery Act
SARA/EPCRA: Superfund Amendment Reauthorization Act / Emergency Planning and Community Right-to-know Act
TRI: Toxic Release Inventory

## B.3 DDT CHEMICAL PROFILE

### *Description*

DDT is a manufactured chemical widely used as a pesticide that does not occur naturally. DDT was one of the most commonly used chemicals for controlling insect pests on agricultural crops after 1945. It was also highly effective in controlling insects that carry such diseases as malaria and typhus. Under the authority of the EPA, all registrations of DDT have been canceled, prohibiting the use of this compound in the U.S. DDT is not currently manufactured in the U.S., although it is not illegal to do so. In other countries, the manufacture and use of DDT for agriculture and disease control programs continues.

Technical DDT is primarily composed of three forms: p,p'-DDT (85%), o,p'-DDT (15%), and o,o'-DDT (trace), all of which are white, crystalline, tasteless, and almost odorless solids. DDE and DDD, similar compounds which are also the breakdown products of DDT in the environment, are found in small amounts as contaminants in technical DDT.

### *Sources and Sectors*

The primary sources of DDT and metabolites to the environment are volatilization to the atmosphere from past manufacture and application sites, and from current manufacture and use abroad.

Known or suspected sources include:

- Historical applications
- Atmospheric transport
- Hazardous waste sites associated with manufacture, transfer, or use
- Continued use of Dicofol pesticide (containing DDT impurity)

### *Exposure and Health Effects*

The primary human exposure pathway for DDT is through ingestion of contaminated food or through inhalation. However, small amounts of DDT still present in soils throughout the U.S. as the result of historical applications may represent an additional exposure pathway. DDT is also present in small quantities (<0.1%) in Dicofol, a pesticide currently used in the U.S. and Canada. However, current Dicofol usage data indicates that DDT releases to the environment from this source are likely to be small.

Short-term health effects associated with DDT can include headaches, nausea, excitability, tremors, diarrhea, disturbed gait, seizures and convulsions. Prolonged and repeated exposure can irritate the eyes, skin, nose, and throat. Long-term health effects may include cancer, liver damage, and fertility problems. In the body, DDT is stored in fatty tissue and tends to leave the body very slowly with decreasing exposure. Nursing infants may be exposed to DDT through breast milk. There is limited evidence that correlations may exist between maternal DDT blood levels and miscarriage in humans. However, the confounding effects of other organochlorine compounds make it impossible to positively attribute the effects to DDT. DDT has been classified by EPA as a probable human carcinogen.

### *Sensitive Subpopulations and Geographic Areas*

Numerous hazardous waste sites throughout the U.S. associated with past manufacture, production, distribution, and disposal contain elevated levels of DDT. These sites can result in localized exposure. Elevated levels of DDT found in the air in Southwestern Michigan are currently being investigated, although the source has not been identified.

### *Environmental Impacts*

Historically, DDT was released to the environment during its manufacture and use as an insecticide. DDT is very persistent in the environment. It has an extremely low solubility in water and therefore tends to bind to soils and sediments. Its persistence, combined with wind and water erosion and the resulting long range atmospheric transport, have made the compound virtually ubiquitous in the environment. DDE and DDD are the initial breakdown products of DDT in the soil environment. Both sister compounds are highly persistent and have chemical and physical properties similar to those of DDT.

DDT reaches surface waters primarily by runoff or atmospheric transport. The reported half-life for DDT in the water environment ranges from a few days for fast-moving environments (where the compound is at or near the surface of the water) to more than 150 years. The main degradation and loss pathways in the aquatic environment are volatilization, photo-degradation, adsorption to water-borne particulates, and uptake by aquatic organisms, which store DDT and DDT metabolites in their tissues. In the atmosphere, DDT can photooxidize to carbon dioxide and hydroxyl radicals. DDT is eventually broken down by sunlight or by microorganisms to form DDE or DDD. The presence of DDT (as opposed to DDE or DDD) in samples far from known sources, however, indicates that DDT's photo-degradation is slow under natural conditions. Both wet and dry deposition are significant mechanisms of removal from the air column.

Oral exposure to DDT is moderately to slightly toxic to mammals. Animal studies suggest that short-term exposure to DDT in food may have a harmful effect on reproduction. It is believed that the reproductive effects associated with DDT may be the result of a disruption in the endocrine system. One well documented example of the impact of DDT in birds was the decline in the bald eagle population, which was attributed to egg shell thinning associated with exposures to DDT and DDE. Long-term exposure in animals affects liver function, reproduction and behavior. Initial degradation products in mammalian systems are DDE and DDD, which are very readily stored in fatty tissues. DDT is also highly toxic to, and bioaccumulates in, aquatic organisms.

### *Current Regulations and Programs*

Current regulations and programs targeting DDT emissions are presented in Table 1.

<table>
<tr><th colspan="7">Table 1. Current Regulations and Programs</th></tr>
<tr><th rowspan="5">Standards and Regulations</th><th>CAA</th><th>CWA</th><th>FIFRA</th><th>RCRA</th><th>SARA / EPCRA</th><th>CERCLA</th></tr>
<tr><td>No specific regulations targeting releases to air</td><td>§307 / CWA Priority: Listed as both a toxic and priority pollutant; subject to toxic pollutant effluent limitations (40CFR 129) which may be incorporated into any NPDES permit under §304(b) (40CFR 122) and/or general pretreatment (40CFR 403)<br><br>§304(a) Federal Water Quality Standards for Human Health: 0.59 ng/L</td><td>1972 - All crop production and non-health uses canceled<br><br>1986 - Food and feed additives regulations and tolerances revoked<br><br>1989 - Remaining uses voluntarily canceled due to failure to renew registration</td><td>Subtitle C: DDT-containing substances are classified toxic hazardous wastes (261.33) subject to hazardous waste regulations<br><br>Universal treatment standards for DDT levels in waste (40CFR 268.48)</td><td>§313: Reporting to TRI not required</td><td>§103: Spills of DDT >1 lb. must be reported to the National Response Center</td></tr>
<tr><td colspan="6">Great Lakes Initiative 1995 and Great Lakes Water Quality Agreement, 1987 (concentrations in ng/L)<br>Human Carcinogenic 0.15<br>Human Noncarcinogenic 2<br>Aquatic Life<br>Acute NA<br>Chronic NA<br>Wildlife 0.011</td></tr>
<tr><td colspan="6">Ambient Water Quality Criteria: AWQC (40CFR 131) (concentrations in ng/L)<br>Aquatic Life<br>Freshwater 110.59<br>Saltwater<br>Human Health</td></tr>
<tr><td colspan="6">U.S. Food and Drug Administration Action Levels<br>Fish-fillet 5 mg/kg</td></tr>
</table>

| Table 1. Current Regulations and Programs | |
|---|---|
| **Policy and Programs** | – Binational Toxics Strategy (BNS) Level 1 substance<br>– International Joint Commission (IJC) Critical Pollutant<br>– Bioaccumulative Chemical of Concern (BCC) under the Great Lakes Water Quality Guidance<br>– Tier I chemical under the Canada-Ontario Agreement<br>– Recognized pollutant in Lakes Erie, Michigan, Ontario, and Superior Lakewide Management Plans (LaMPs)<br>– Targeted in Remedial Action Plans (RAPs): Effort by IJC, EPA and other groups to restore beneficial uses to Areas of Concern (AOCs) in the Great Lakes<br>– Persistent Organic Pollutant (POP) by Commission for Environmental Cooperation (CEC) Council Resolution #95-5<br>– North American Regional Action Plan developed under CEC's Sound Management of Chemicals Program<br>– Included in the North American Free Trade Agreement Technical Working Group on Pesticides<br>– Monitored by the Integrated Atmospheric Deposition Network (IADN)<br>– Included in CAA §112(m) program, Atmospheric Deposition to Great Lakes and Coastal Waters<br>– Found in a number of National Priorities List (NPL) hazardous waste sites<br>– Included in the National Water Quality Assessment (NAWQA) Program<br>– National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch Program<br>– Council of Great Lakes Industry BNS Implementation: Search for information regarding the export, storage, and use of chemical intermediates of Level I pesticides<br>– Clean Sweeps Programs: Collection of remaining stores of DDT |

CAA: Clean Air Act
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CWA: Clean Water Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
NPDES: National Pollutant Discharge Elimination System
RCRA: Resource Conservation and Recovery Act
SARA/EPCRA: Superfund Amendment Reauthorization Act / Emergency Planning and Community Right-to-know Act
TRI: Toxic Release Inventory

## B.4 MIREX CHEMICAL PROFILE

### *Description*

Mirex is a man-made chemical formerly used as a pesticide in the United States to control fire ants, especially in the southern United States. Because of its selectiveness and effectiveness against ants, mirex was also used to control ant populations in the western United States as well as in South America and South Africa. The other major use of mirex was as a flame retardant in plastics, rubber, paint, paper, and electrical goods from 1959 to 1972. As a flame retardant, mirex was marketed and sold under the trade name Dechlorane. Under the authority of USEPA, all pesticides uses of mirex were canceled in 1977, and it is no longer produced commercially in the U.S.

Mirex is a snow-white crystalline solid, odorless and fire resistant. In the environment it degrades to photomirex, when exposed to sunlight. Photomirex, like mirex, has harmful health effects. Mirex does not easily dissolve in water or evaporate into the air.

### *Sources and Sectors*

Because mirex is not a naturally occurring chemical, all environmental contamination can be attributed to historical uses.

Known and suspected sources include:

- Hazardous waste sites associated with manufacture, transfer or use
- Historical applications as a pesticide
- Non-pesticide uses of products containing mirex (e.g., fireworks, automotive and electrical products containing the fire retardant Dechlorane)

### *Exposure and Health Effects*

Humans may be exposed to mirex through skin contact, inhalation, and ingestion of contaminated food or water. In general, most current exposures occur through consumption of contaminated food, particularly fish. Mirex is not broken down in the body and very little is excreted in urine and feces. The majority of mirex ingested is transported into the bloodstream and accumulated in body fat. Once it is stored in body fat, it can take several weeks to months to leave the body. Mirex has been shown to enter breast milk from the bloodstream of nursing mothers.

Short-term exposures to mirex can result in trembling, tiredness, weakness, and diarrhea. Harmful effects associated with long-term exposures can include damage to the stomach, intestines, liver, kidneys, eyes, thyroid gland, nervous system, skin, and reproductive system. Mirex is also considered a probable carcinogen and may increase the chance of miscarriage in pregnant women.

### *Sensitive Subpopulations and Geographic Areas*

Mirex was used as a pesticide in the southern and western U.S. Production and use as a fire retardant was documented to occur in the Eastern Great Lakes Basin (Ontario, Michigan, Ohio and New York).

### *Environmental Impacts*

Mirex breaks down slowly in the environment and may persist for years in soil, aquatic sediment, and water. It has been found in soils throughout the U.S. as a result of historical applications, with a half life in soils of up to ten years. Mirex binds easily to soil and sediment particles and therefore is not found to any great extent in surface water or groundwater. Nor does it evaporate to any great extent from surface water or soil. Due to its hydrophobic nature and low vapor pressure, atmospheric transport is unlikely. Although mirex was detected in surface waters of Lakes Huron, Erie, and Ontario in the 1980s, recent monitoring programs in the Great Lakes have not detected measurable quantities of mirex in surface waters.

In aquatic systems, mirex tends to accumulate in sediments. In Lake Ontario and its tributaries, mirex has been measured at various depths in sediment cores, with peak concentrations corresponding to the mid-1960s, likely as the result of increased production and use during that time period. In addition, mirex is bioaccumulative and has been measured in aquatic and avian species.

Short-term exposures to elevated concentrations of mirex can result in weight loss and effects on liver function and reproduction in wildlife. At higher concentrations, it is lethal to fish and birds. Long-term ecological exposure may affect wildlife through impaired reproductive performance and liver function, and skin abnormalities. Mirex has also caused reduction of germination and emergence in several plant species. Mirex has a high bioconcentration factor, resulting in high concentrations in aquatic organisms.

### *Current Regulations and Programs*

Current regulations and programs targeting mirex emissions are presented in Table 1.

<table>
<tr><th colspan="7">Table 1. Current Regulations and Programs</th></tr>
<tr><td rowspan="5">Standards and Regulations</td><th>CAA</th><th>CWA</th><th>FIFRA</th><th>RCRA</th><th>SARA / EPCRA</th><th>CERCLA</th></tr>
<tr><td>No specific regulations targeting releases to air</td><td>No specific regulations targeting releases to water<br><br>§304(a) Federal Water Quality Standards for Human Health: existing, value not available</td><td>1977– All pesticide uses canceled</td><td>Mirex-containing substances are not subject to hazardous waste regulations or treatment standards</td><td>Reporting to TRI not required</td><td>No spill reporting requirements</td></tr>
<tr><td colspan="6">Great Lakes Initiative 1995 and Great Lakes Water Quality Agreement, 1987 (concentrations in ng/L)<br>Human Carcinogenic: NA<br>Human Noncarcinogenic: NA<br>Aquatic Life<br>Acute: NA<br>Chronic: NA<br>Wildlife: NA</td></tr>
<tr><td colspan="6">Ambient Water Quality Criteria: AWQC (40CFR 131) (concentrations in ng/L)<br>Aquatic Life<br>Freshwater: NA<br>Saltwater: NA<br>Human Health: NA</td></tr>
<tr><td colspan="6">U.S. Food and Drug Administration Action Levels<br>Fish-fillet: 0.1 mg/kg</td></tr>
<tr><td>Policy and Programs</td><td colspan="6">– Binational Toxics Strategy (BNS) Level 1 substance<br>– International Joint Commission (IJC) Critical Pollutant<br>– Bioaccumulative Chemical of Concern (BCC) under the Great Lakes Water Quality Guidance<br>– Tier I chemical under the Canada-Ontario Agreement<br>– Recognized pollutant in Lake Erie and Lake Ontario Lakewide Management Plans (LaMPs)<br>– Targeted in Remedial Action Plans (RAPs): effort by IJC, EPA and other groups to restore beneficial uses to Areas of concern (AOCs) in the Great Lakes<br>– Persistent Organic Pollutant (POP) by Commission for Environmental Cooperation (CEC) Council Resolution #95-5<br>– Included in the UN ECE Convention on Long-Range Transboundary Air Pollution (LRTAP) protocol<br>– Included in the North American Free Trade Agreement Technical Working Group on Pesticides<br>– Monitored by the Integrated Atmospheric Deposition Network (IADN) (at some stations)<br>– Found in a few National Priorities List (NPL) hazardous waste sites<br>– National Oceanic and Atmospheric Administration's (NOAA) Mussel Watch Program<br>– Clean Sweeps Programs: Collection of remaining stores of mirex</td></tr>
</table>

CAA: Clean Air Act
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CWA: Clean Water Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
NPDES: National Pollutant Discharge Elimination System
RCRA: Resource Conservation and Recovery Act
SARA/EPCRA: Superfund Amendment Reauthorization Act / Emergency Planning and Community Right-to-know Act
TRI: Toxic Release Inventory

## B.5  TOXAPHENE CHEMICAL PROFILE

### *Description*

Toxaphene, one of the most widely-used pesticides in the U.S. from 1947 to 1980, is a man-made mixture of more than 670 chemicals.  In its original form, it is a yellow to amber waxy solid that smells like turpentine.  Toxaphene tends to evaporate when in solid form or when mixed with liquids and will not burn.

Toxaphene was primarily used in the southern states to control pests on cotton crops.  It was also used to a lesser extent on other crops, livestock and poultry, and to remove unwanted fish stocks from lakes.  In fact, toxaphene was one of the world's most widely used pesticides in the 1970s.

### *Sources and Sectors*

Due to its persistence in the environment, much of the toxaphene currently found in the environment can be attributed to historical sources.  Atmospheric transport is thought to be a significant source of toxaphene in many areas where it was not commonly applied as a pesticide.

Known and suspected sources include:

- Historical applications
- Atmospheric transport
- Hazardous waste sites associated with manufacture, transfer, or use

### *Exposure and Health Effects*

Humans may be exposed to toxaphene through skin contact, inhalation, and ingestion of contaminated food or water.  In general, most current exposures occur through either consumption of contaminated food or exposures to soils that were historically contaminated.  In the body, toxaphene is rapidly broken down and removed through urine and feces within a few weeks.  It has not been shown to accumulate in humans to any appreciable degree.

Short-term exposure to very high concentrations of toxaphene may result in restlessness, tremors, vomiting, diarrhea, convulsions, seizures, spasms, and hyperexcitability or death.  Long-term health effects associated with concentrations more typically found in the environment can include liver and kidney damage, central nervous system effects, possible immune system suppression, and cancer.  In addition, toxaphene has been classified by EPA as a probable human carcinogen based on animal studies of mammalian species exposed to chronic doses.

### *Sensitive Subpopulations and Geographic Areas*

Toxaphene was primarily used in the southern U.S. for pest control.  It was also used in the Great Lakes region for control of unwanted fish stocks in small inland lakes. Concentrations in these areas remain elevated.

### *Environmental Impacts*

Toxaphene has been demonstrated to be present throughout the environment, including water, sediment, soil, biota, and air. Toxaphene is very persistent and will remain in surface soils anywhere from a few months to several years. Evaporation from surface soils may be a significant source of toxaphene to the atmosphere. Toxaphene can be transported unchanged in the atmosphere over long distances. It does not readily dissolve in water and, therefore, concentrations in surface water and groundwater are typically low. However, of surface water measurements from areas around the world, the highest concentrations were found in Lake Superior in the United States. Concentrations in soils and sediments are typically higher. In aquatic systems, toxaphene is typically found primarily in sediments due to its strong tendency to bind to particles. In Great Lakes sediments, concentrations as high as 45 ppb have been reported. The presence of this compound in recent samples is generally believed to be associated with past releases during its use as a pesticide. Toxaphene also bioaccumulates in the food chain, and elevated concentrations have been measured in aquatic species.

Acute exposures to toxaphene are typically lethal to mammalian, aquatic, and avian species. Chronic exposures to toxaphene have been associated with effects such as a shortened lifespan, reproductive problems, reduced fertility, and changes in appearance or behavior. In addition, damage to the liver, kidneys, adrenal glands and the immune system have been noted. Studies have also attributed cancer of the thyroid gland to toxaphene exposure. Birth defects have also been noted in fetuses exposed prenatally. There is also limited evidence that toxaphene may have some effects on the endocrine system at chronic doses.

### *Current Regulations and Programs*

Current regulations and programs targeting toxaphene emissions are presented in Table 1.

## Table 1. Current Regulations and Programs

| | CAA | CWA | FIFRA | RCRA | SARA / EPCRA | CERCLA |
|---|---|---|---|---|---|---|
| **Standards and Regulations** | §112(b): Designated a HAP; subject to NESHAPS and compliance with MACT standards | §307/ CWA Priority: Listed as both a toxic and priority pollutant; subject to toxic pollutant effluent limitations (40CFR 129) which may be incorporated into any NPDES permit under §304(b) (40CFR 122) and/or general pretreatment (40CFR 403)<br><br>§304(a) Federal Water Quality Standards for Human Health (water and organism): 0.73 ng/L | 1982 - Most uses canceled<br><br>1990 - Remaining pesticide uses canceled<br><br>1993 - Food tolerances revoked | Subtitle C: Toxaphene-containing substances are classified acute hazardous wastes (261.33); subject to hazardous waste regulations and ground water monitoring requirements (40CFR 264.94)<br><br>Universal treatment standards for toxaphene levels in waste (40CFR 268.48) | §313: Releases must be reported to TRI (40CFR 372.65)<br><br>(Jan. 5, 1999 Federal Register proposed reduction of TRI reporting threshold to 10 lbs. per year (64FR 687)) | §103: Spills of toxaphene >1 lb. must be reported to the National Response Center |

**Great Lakes Initiative 1995 and Great Lakes Water Quality Agreement, 1987 (concentrations in ng/L)**

| | |
|---|---|
| Human Carcinogenic | 0.068 |
| Human Noncarcinogenic | NA |
| Aquatic Life | |
| Acute | NA |
| Chronic | NA |
| Wildlife | NA |

**Ambient Water Quality Criteria: AWQC (40CFR 131) (concentrations in ng/L)**

| | |
|---|---|
| Aquatic Life | |
| Freshwater | 220.73 |
| Saltwater | |
| Human Health (water and organism) | |

**U.S. Food and Drug Administration Action Levels**

| | |
|---|---|
| Fish-fillet | 5 mg/kg |

| Table 1. Current Regulations and Programs | |
|---|---|
| **Policy and Programs** | – Binational Toxics Strategy (BNS) Level 1 substance<br>– International Joint Commission (IJC) Critical Pollutant<br>– Bioaccumulative Chemical of Concern (BCC) under the Great Lakes Water Quality Guidance<br>– Tier I chemical under the Canada-Ontario Agreement<br>– Recognized pollutant in Lake Superior Lakewide Management Plans (LaMPs)<br>– Targeted in Remedial Action Plans (RAPs): effort by IJC, EPA and other groups to restore beneficial uses to Areas of Concern (AOCs) in the Great Lakes<br>– Persistent Organic Pollutant (POP) by Commission for Environmental Cooperation (CEC) Council Resolution #95-5<br>– Included in the UN ECE Convention on Long-Range Transboundary Air Pollution (LRTAP) protocol<br>– Included in the North American Free Trade Agreement Technical Working Group on Pesticides<br>– Monitored by the Integrated Atmospheric Deposition Network (IADN) (at some stations)<br>– Included in CAA §112(m) program, Atmospheric Deposition to Great Lakes and Coastal Waters<br>– Found in a number of National Priorities List (NPL) hazardous waste sites<br>– Cause of fish consumption advisories in Lake Superior<br>– Clean Sweeps Programs: Collection of remaining stores of toxaphene |

CAA: Clean Air Act
CERCLA: Comprehensive Environmental Response, Compensation, and Liability Act
CWA: Clean Water Act
FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act
HAP: Hazardous air Pollutant
MACT: Maximum Achievable Control Technology
NESHAPS: National Emissions Standards for Hazardous Air Pollutants
NPDES: National Pollutant Discharge Elimination System
RCRA: Resource Conservation and Recovery Act
SARA/EPCRA: Superfund Amendment Reauthorization Act / Emergency Planning and Community Right-to-know Act
TRI: Toxic Release Inventory

# APPENDIX C
# SUPPORTING TABLES ON SUPERFUND SITES CONTAMINATED WITH PESTICIDES

# Table 1:  Superfund Sites* with Pesticides

This table Includes sites on the final NPL, excluding sites that are military installations or drum reconditioners. Also, only disposal areas that contained pesticides as a major type of contaminant were included.  Sites are classified as pesticide manufacturers or pesticide formulators based on descriptions of the past operations.  The assigned category doesn't always match the brief description in Table 1.

*sites are listed by state

| **State** | **Location** | **Site Name** | **Brief description** |
|---|---|---|---|
| **PESTICIDE MANUFACTURERS (also see Table 2 below)** | | | |
| AL | Bucks | 1. Stauffer Chemical Co. | Ag chem manufacturing facility, currently Zeneca, active manufacturing.  Contamination: ponds, swamp, groundwater |
| AL | McIntosh | 2. Ciba-Geigy Corp. | Ag chem manufacturing, including DDT, then other herbicides, insecticides and other chemicals. Contamination: shallow aquifer, deep aquifer and soil at 11 waste management areas.  Look at other RODs |
| AL | Limestone/ Morgan Cos. | 3. Triana/Tennessee River | DDT manufactured 1947-1970.  Manufacturing, handling and disposal practices lead to discharge of DDT residues through drainage system into creek/ river system. Contaminated surface water and sediment. |
| AR | Jacksonville | 4. Vertac, Inc. | Herbicide and pesticide manufacturing facility, including Agent Orange.  Extensive on-site and off-site contamination, including dioxins, PCBs, pesticides, phenols, inorganics.  Contamination: soil, sediment, sludge, debris |
| CA | Torrance | 5. Montrose Chemical Co. | Operations included formulation, grinding, packaging, and distributing DDT.  Contamination: on- and off-site soils, surface water, and sediments via storm water run-off and aerial emissions.  (No ROD) |
| CO | Commerce City | 6. Sand Creek Industrial Site | 1960s, pesticide manufacturing operations began by the Colorado Organic Chemical Co.  Fires in 1968 and 1977 and improper storage practices led to release of high levels of organophosphates, chlorinated hydrocarbons, and thermally altered pesticides.  Contamination of soil, onsite buildings and tanks. |
| FL | Clermont | 7. Tower Chemical Co. | Abandoned manufacturing facility; manufactured, formulated and stored various pesticides.  Soil and ground water are contaminated with DDT, pesticides and metals. |
| GA | Fort Valley | 8. Woolfolk Chemical Works, Inc. | Produce and package of organic and inorganic insecticides, including arsenic and lead-based products, DDT, lindane, and toxaphene.  Contaminated buildings, soil, debris, ground water, and surface water. |

| State | Location | Site Name | Brief description |
|---|---|---|---|
| IL | Marshall | 9. Velsicol Chemical Corp. | From 1930s-87, used for production of disposal practices for petroleum derivatives including resins, solvents, and pesticides, including chlordane manufacturing. Contaminated soil, sediments, and ground water. |
| MI | St. Louis (Gratiot County) | 10. Velsicol Chemical Corp. | From 1936 until 1978, produced various chemical compounds and products including DDT . On-site (54 acres) groundwater and sediments in a river bordering the site are contaminated with DDT and other chlorinated compounds. |
| NJ | Franklin Twp. | 11. Myers Property | Pesticides manufactured by several companies 1928-1959. Contaminated gw, soil, buildings, surface water, and wetlands. |
| NJ | Newark | 12. Diamond Alkali | Used for chemical manufacturing by numerous companies for more than 100 years. Beginning in mid-1940s, began production of DDT and phenoxy herbicides. Primary contaminants of concern affecting soil, structures, gw and air include dioxin and DDT. |
| PA | Lock Haven | 13. Drake Chemical | Site purchased in 1962 by Drake Chemical; manufactured small batches of intermediate chemicals for producers of dyes, pharmaceuticals, cosmetics, textiles and pesticides, including the herbicide Fenac, a major contaminant. |
| PA | State College | 14. Centre County Kepone Site (Ruetgers-Nease Corp.) | Since 1958, produced a variety of organic chemicals, including intermediates used in the soap and detergent industry, metal plating, pharmaceuticals and ag chem industries. Major contaminants include kepone and mirex. |
| **PESTICIDE FORMULATORS** | | | |
| AL | Montgomery | T.H. Agriculture & Nutrition | Sales, packaging, and storage facility for water treatment and plating chemicals; store and distribute agricultural and industrial chemicals, chemical blending and distributing. |
| CA | Arvin | Brown & Bryant, Inc. | Pesticide mixer and custom applicator facility. Contamination: former waste pond and a former sump area. Groundwater, surface and sub-surface soils. |
| CA | Richmond | United Heckathorn | No chemicals were manufactured. In the past, nearly all operations were DDT processing, including mixing, blending, grinding, and packaging. Contamination: DDT everywhere, soil, buildings, channels, canals, sediment, etc. |

| State | Location | Site Name | Brief description |
|---|---|---|---|
| CO | Commerce City | Woodbury Chemical Co. | Operated a pesticide manufacturing facility from late 1950s to 1965 when the facility was destroyed by fire. Fire rubble and debris contaminated with organochlorine pesticides were disposed on an adjacent empty lot, which is the designated site. Significant contamination is limited to the rubble piles, but also contaminated soils, sediment (on and off site), and gw. |
| FL | Orlando | Chevron Chemical Co. (Ortho Division) | Chevron Chemical Co. - chemical blending facility for pesticides and other crop sprays, including chlordane, lindane, dieldrin and aldrin. Also (1978-86), Central Florida Mack Trucks Service Center - overhauling truck engines, starters, generators and front/rear ends. Contaminated soil and ground water. (No ROD) |
| FL | Tampa | Helena Chemical Co. | From 1967-81, facility received bulk shipments of various agricultural chemicals that were then formulated into liquid fertilizers and nutritional products. Since 1981, used to store, repackage, and distribute liquid pesticides; formulate on a demand-basis. Pesticides and pesticide-constituents detected in on- and off-site ground water and soil. (No ROD) |
| FL | Tampa | Stauffer Chemical Co. | Manufactured pesticides from 1951-86, including chlordane, alpha-, beta-, and gamma-BHC, and toxaphene. These & other compounds have been detected in soil, ground water and/or air samples. (No ROD) |
| FL | Princeton | Woodbury Chemical | Pesticide formulator, toxaphene spill. Contaminated soil removed for off site disposal. Deleted from NPL in 1995. |
| GA | Albany | T.H. Agriculture & Nutrition | Since the 1950s, used as a formulation and packaging plant for agricultural chemicals. Contamination: buildings, debris, soil, ground water. GW clean-up standards for pesticides. |
| GA | Tifton | Marzone Inc./Chevron Chemical Co. | Pesticide formulating facility from 1950-83, then used for general storage and plant seedling distribution. Contaminated soil and ground water. |
| IA | Council Bluffs | Aidex Co. | Abandoned pesticide formulation facility. Contamination of soil and onsite ground water resulted from handling, storing and disposing of pesticide formulation process waste and post-firefighting operations. Significant concentrations of OPs, OCs, and triazines. |
| MO | Cape Girardeau | Kem-Pest Laboratories | Contamination resulted from the manufacture of pesticide products from 1965-77. Contamination: soil, sediment in drainage channels and ground water. |

| State | Location | Site Name | Brief description |
|---|---|---|---|
| NC | Aberdeen | Geigy Chemical Corp. | 1947-67, site changed hands numerous times, but was always used for pesticide mixing and formulation, not manufacturing. 1985-89, used as pesticide and fertilizer distribution center. Soil and ground water contaminated with aldrin, dieldrin, toxaphene, DDD, DDE, and DDT. Specific clean-up levels for these. |
| NC | Statesville | Farmers Cooperative Exchanges (FCX) | 1940-86, operated as an agricultural distribution center that formulated, repackaged, warehoused, and distributed farm chemicals (pesticides and fertilizers), and milled and sold field grains. 5,000-10,000 pounds of DDT, DDE and chlordane improperly disposed in trenches. Soil and gw. Specific clean-up levels for pesticides. (See other RODs) |
| NC | Washington | Farmers Cooperative Exchanges (FCX) | 1945-85, used as a farm supply distribution center that repackaged and sold pesticides, herbicides, and tobacco-treating chemicals. Five source areas of contamination related to improper pesticide handling and disposal practices. Soil and gw. Specific clean-up levels for pesticides. |
| NJ | Edison Twp | Chemical Insecticide Corp. | 1958-70 produced and stored pesticide formulations at the property resulting in soil, surface water and gw contamination. Wide variety of contaminants. Specific clean-up levels for DDT |
| SC | Fairfax | Helena Chemical Co. | Pre-1960 to 1978, used for the production of liquid and powdered insecticides. Site-related pesticides in the soils, sediment, debris, gw and surface water. |
| TN | Arlington | Arlington Blending & Packaging | 1971-1978, formulated and packaged various pesticide and other chemical formulations. Contamination from spills and leaks soaking into soil and flooring and migration off site via surface runoff; also discharge of process water. Soil, debris and gw contamination. |
| UT | Salt Lake City | Wasatch Chemical | Active chemical production, storage and distribution facility. 1957-1986, used for production, packaging, storage and distribution of various chemical products, including industrial chemicals, acids, solvents, pesticides and fertilizers. Contaminated soil, sludge, and gw. |
| WA | Yakima | FMC Corp. (Yakima Pit) | Former pesticide formulation facility. 1951-1986, manufactured pesticide dusts and liquids. Contaminated soil and debris. Hot spots of DDT and other pesticides in the former disposal pit. |

| State | Location | Site Name | Brief description |
|---|---|---|---|
| | | **OTHER TYPES OF FACILITIES** | |
| AS | Taputimu | Taputimu Farm | (Pesticide storage) Taputimu Farm is a facility owned by the government of American Samoa and is the territory's primary repository of unused and out-dated agricultural chemicals and pesticides. Has plywood walls and corrugated metal roof. |
| GA | Brunswick | Hercules 009 Landfill | (Landfill) Permitted in 1975 for disposal of toxaphene-contaminated wastewater sludge from manufacturing. Six disposal cells (7 acres) estimated to contain 33,000 cubic yards of 1% toxaphene content (about 800,000 lbs of toxaphene). Contaminated soils on site. |
| IA | Hospers | Farmers' Mutual Coop | (Pesticide retail) Active grain storage facility. Since 1908, used site for purchasing and storing of grain and ag chemicals (pesticides and fertilizers); also grain fumigation. Contamination: shallow ground water. Treatment standards for some pesticides. |
| NC | Aberdeen | Aberdeen Pesticide Dumps | (Disposal area) Trenches contain about 12 million pounds of pesticide wastes. Contaminated soil and debris. |
| NE | Hastings | Hastings Ground Water Site | (Grain storage) Currently owned by Farmland Industries, who acquired property through a merger with Far-Mar-Co. Current and previous owners used various chemicals on-site for fumigation of stored grain. Soil and gw contaminated with carbon tet and EDB. |
| NY | Shelby | FMC Dublin Road | (Disposal area) 1933-68 used to dispose of coal ash, cinders, lab wastes, chemical and pesticide residuals, and building debris. FMC purchased site in 1974. Pesticide, organics, arsenic and lead contamination in soil, sediment, gw and surface water. Specific clean-up levels for pesticides. |
| PA | Harrison Twp | Lindane Dump | (Disposal area) Used for waste disposal from 1850-1980. Material disposed included lindane filter cake residuals and waste sulfuric acid containing DDT. |
| TN | Gallaway | Gallaway Ponds Site | (Disposal area) Low ridge that has been extensive mined for sand and gravel, producing a landscape doted with water-filled its up to 50 feet deep. Disposal of hazardous materials at the site for an undetermined period of time, including small glass bottles holding quality control samples from pesticide blending operations. Primary contaminants include pesticides, chlordane and toxaphene. |

| State | Location | Site Name | Brief description |
|---|---|---|---|
| TX | Crystal City | Crystal City Airport | (Aerial application) Site is a municipal airport. Several private aerial pesticide application companies conducted business there until 1982. Highly contaminated soil from pesticides left by companies no longer in operation. Major contaminants include DDT, toxaphene and arsenic. |
| WV | Near Leetown | Leetown Pesticide Site | (Mixing/loading sites) Three most contaminated areas are a former pesticide pile area (Miller Chemical Co.), the former Jefferson Orchard mixing area, and the former Crimm Orchard packing shed. Soil contaminated with unidentified pesticides. |
| **WOOD TREATMENT FACILITIES** | | | |
| CA | Weed | J. H. Baxter & Co. | Continues to be used for wood treatment operations and lumber product manufacturing. Contamination: soil, sediment, ground water and surface water. |
| FL | Gainesville | Cabot/Koppers | Inactive Cabot Carbon property - pine tar and charcoal generation. Currently operation Koppers portion of site has been wood preserving operation since 1916. Soil (on- and off-site) and ground water contamination. |
| IN | Indianapolis | Carter Lee Lumber Co. | Currently storage for a commercial lumber yard. 1940-1985, operated a small quantity batch-load wood preserving operation immediately off-site. EPA determined no threat to human health/environment. |
| LA | Slidell | Bayou Bonfouca | Abandoned creosote works facility; operated since 1904 under ownership of various creosote companies. Contaminated sediments, soil, and groundwater. |
| MD | Hollywood | Southern Maryland Wood Treating | 1965-75, operated as a pressure treatment facility for wood preservation. Currently, part of site is a retail outlet for pretreated lumber and crab traps. Contaminated soil, surface water, sediments and debris. |
| NY | Sydney | GCL Tie and Treating | Site has been used for wood preserving; there was a release of about 30,000 gallons of creosote. |
| SC | Charleston | Koppers Co., Inc. | Used for wood treatment from 1940-1978 and a phosphate plant, followed by other operations including the cleaning, repair and refurbishing of military ships. |
| TN | Jackson | American Creosote Works | Early 1930s-1981, wood preserving operations using creosote and PCP. Contamination of sludges, site structures, debris and tanked liquids. |
| UT | Salt Lake City | Utah Power & Light/American Barrel | Inactive coal gasification and wood treating plant; assumed also a drum reconditioning facility. Creosote pole treating operations occurred 1927-1958. Pesticide contamination (other than creosote) from drum operations. |

| State | Location | Site Name | Brief description |
|---|---|---|---|
| VA | Richmond | Rentokil Virginia Wood Preserving Division | Former wood treating facility. 1957-1990 onsite wood treatment operations used products such as CPC, fuel oil, chromium zinc arsenate, copper chromated arsenate (CCA), fire retardant and xylene. Contaminated soil, sediment, debris, sludge, gw and surface water. |
| WA | Bainbridge Island | Wyckoff Co./Eagle Harbor | 1903-1959 operated a shipyard resulting in releases of metals and organics. 1905-1988 wood treating operations conducted involving pressure treatment with creosote and PCP. Contamination of subtidal/intertidal sediment, soil and gw. |

**Table 2: Pesticide Manufacturing Facilities that are or were Superfund Sites**

To the extent possible, the location, name, site description, primary contaminants, the extent of contamination (which media, buildings, debris, etc), and the selected treatment options are identified for each site.

| | |
|---|---|
| **1. Stauffer Chemical Co., Bucks, Alabama** | |
| Site | - Active pesticide manufacturing facility; different owner/operator now.<br>- Unknown quantity of sludges and solid wastes placed in two waste disposal sites until 1974. |
| Contamination | - Soil, ground water, ponds, swamp/wetlands, sediment, fish, sludges.<br>- Thiocarbamates.<br>- Mercury, carbon tetrachloride. |
| Clean-up Approach | Three long-term remedial phases:<br>(1) Ground water: intercept and treatment system with surface water discharge. Treatment option(s) not specified, but thermal desorption and vapor extraction are under consideration.<br>(2) Four solid waste management units: Maintain cap on two units; no further action required at one; bioremediation (design underway) on the other unit.<br>(3) Swamp: dig up the areas of highest contamination and cap the area where the material is placed. |
| **2. Ciba-Geigy Corp., McIntosh, Alabama** | |
| Site | - Pesticide manufacturer. Originally produced DDT only, then added other pesticides and chemical products.<br>- Wastes were managed on-site; there are 11 former disposal areas. |
| Contamination | - Soil, ground water, surface water, sediment, sludges.<br>- DDT, lindane, and other pesticides.<br>- Heavy metals including chromium and mercury. Volatile organic compounds (VOCs) including chlorobenzene, toluene, and phenols. |
| Clean-up Approach | Four long-term remedial phases:<br>(1) Ground water: Pump, treat in plant's on-site biological wastewater treatment system, discharge into river.<br>(2) Deep aquifer and soil: Excavate the soil and sludges from the 11 former disposal sites. Some will undergo on-site thermal treatment; some will undergo stabilization/solidification followed by placement in an on-site land vault. For areas deeper than 20 feet: in-situ soil flushing and bioremediation; and extraction wells.<br>(3) Wetlands and dilute ditch: Excavate contaminated media, continue bioremediation and ecological studies; highly contaminated materials will be thermally treated on-site. (See #2.)<br>(4) Bluff line: Excavate contaminated soil; Some will undergo on-site thermal treatment; some will undergo stabilization/solidification followed by placement in an on-site land vault. |
| **3. Triana/Tennessee River, Limestone/Morgan Cos., Alabama** | |
| Site | - Company manufactured DDT from 1947 to 1970; plant was closed and demolished in 1971.<br>- Manufacturing, handling, and disposal practices led to discharge of DDT residues through the drainage system into the Tennessee River tributary system.<br>- An estimated 475 tones of DDT residues accumulated in the sediment of the tributary system. |
| Contamination | - DDT. |

| | |
|---|---|
| Clean-up Approach | - Bypassing and burying on-site the most heavily contaminated channel area; continue fish, water, and sediment monitoring; isolate DDT from nearby population and environment. |
| **4. Vertac, Inc., Jacksonville, Arkansas** | |
| Site | - Several owners; produced 2,4,5-T from 1948-1979; produced Agent Orange in the 1960's; produced 2,4-D and 2,4.5-TP (Silvex) in the 1970's.<br>- All manufacturing ceased in 1986.<br>- Inadequate waste disposal methods and production controls, e.g., untreated wastewater discharged directly to creek and on-site landfills and burial areas. |
| Contamination | - Soil, ground water, sediment, fish, buildings, debris, drummed waste.<br>- Dioxin.<br>- 2,4-D; 2,4,5-T; herbicide production wastes.<br>- Chlorinated benzene, chlorinated phenols. |
| Clean-up Approach | Four phases:<br>(1) Off-site areas: Dewater and cap aeration basin and sludge drying beds; excavation and on-site landfilling of sludge, sediment, and soils from sewer line and off-site areas. (Completed 1997).<br>(2) Above-ground components: Demolish buildings and equipment and dispose in on-site landfill. Off-site incineration of trash, pallets, and process vessel waste.<br>(3) Soils, foundation, and underground utilities: Excavation and on-site landfilling of dioxin-contaminated soils. (Completed 1997).<br>(4) Ground water: Extraction wells to eliminate eastward component of ground water flow; French drain to restrict westward movement; prohibit water supply wells in area. (All but water restrictions completed by 1998.) |
| **5. Montrose Chemical Co., Torrance, California** | |
| Site | - Manufactured DDT from 1947-1982.<br>- On-site disposal for chemical raw materials, DDT and waste products; on-site settling and recycling pond.<br>- Another Superfund site is immediately adjacent and ground water contamination from the two sites has merged. |
| Contamination | - Soil, ground water, surface water, sediments.<br>- DDT and monochlorobenzene (raw material for making DDT). |
| Clean-up Approach | - In 1985, installed an asphalt cap over some of the contaminated soil.<br>- Soil remedy depends on whether residents will be permanently relocated (i.e., on future land use) and ground water remedy.<br>- Ground water: a joint feasibility study is being conducted by both Superfund sites. |
| **6. Sand Creek Industrial Site, Commerce City, Colorado** | |
| Site | - Delisted from National Priorities List in December 1996.<br>- Colorado Organic Chemical Company (COC) is one of four known sources of contamination on the site. The others include an oil refinery, acid pits, and a landfill.<br>- COC began manufacturing pesticides in the 1960's.<br>- Fires in 1968 and 1977 and improper storage practices resulted in the release of high levels of contaminants. |
| Contamination | - Soil, ground water, and drummed waste.<br>- Organophosphate pesticides, thermally-altered pesticides<br>- Chlorinated hydrocarbons |

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| Clean-up Approach | Several long-term phases:<br>(1) Initial steps: removed waste drums and contaminated soil and fenced the COC facility. (Completed in 1984)<br>(2) COC facility: removed tanks and drums containing pesticides and solvents and transported them to approved disposal facilities. Also placed a synthetic cap to prevent erosion and vapor emissions. (Completed in 1988).<br>(3) Tanks and buildings: demolished the tanks and buildings and disposed at an approved facility. (Completed in 1990)<br>(4) Soils: Surface soils were treated using Low Temperature Thermal Treatment (using activated carbon). Subsurface soils were treated using Soil Vapor Extraction. (Completed in 1990)<br>(5) Landfill gas: Installed a methane gas extraction and treatment system in 1991 and 1992; operation will continue.<br>(6) Ground water: Removed more than 20,000 pounds of liquid floating on the ground water in two localized areas. (Completed by 1995) Will monitory ground water semi-annually. |
| **7. Tower Chemical Co., Clermont, Florida** | |
| Site | - Abandoned pesticide manufacturing facility; manufactured, produced, and stored various pesticides from 1957 to 1981.<br>- Discharged acidic wastewaters into an unlined percolation/evaporation pond; burned and buried wastes on-site; the wastewater pond overflowed into an adjacent swamp. |
| Contamination | - Soil, ground water, surface water, sediments, drummed waste.<br>- DDT and other pesticides.<br>- Copper and VOCs, including ethyl benzene. |
| Clean-up Approach | - Ground water: remove and treat approximately 100 million gallons and discharge to surface water; treatment method not specified.<br>- Soil: excavate and incinerate about 9,000 cubic yards of soil.<br>- Other: decontaminate storage tanks and concrete pads. |
| **8. Woolfolk Chemical Works, Inc., Fort Valley, Georgia** | |
| Site | - Throughout the site's history (several companies), the facility has been used for the production of organic and inorganic insecticides (including arsenic- and lead-based products) and other pesticides. During the 1950's, began to produce DDT, lindane, toxaphene, and other chlorinated organics.<br>- Currently, there is an active pesticide formulator operating. |
| Contamination | - Soil, ground water, buildings.<br>- Dioxin contamination is limited to a building and the soils beneath it.<br>- Pesticides including chlordane, DDT, lindane, and toxaphene.<br>- Heavy metals including lead and arsenic; VOCs and semi-volatiles. |
| Clean-up Approach | Four long-term remedial phases:<br>(1) Ground water: pump and treat; treatment method is not specified.<br>(2) Site redevelopment: try to redevelop a portion of the site; reuse some of the properties for a public library and other local organizations; no residential use or ground water use.<br>(3) On-site areas: Evaluating remedy for four areas of concern.<br>(4) Off-site areas: Clean and monitor eight homes where arsenic and lead were detected. |
| **9. Velsicol Chemical Corp., Marshall, Illinois** | |

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|---|---|
| Site | - Pesticide and chemical manufacturing facility from mid-1930's to 1987, when operations ceased.<br>- Produced chlordane from mid-1940's through 1987.<br>- Wastes were disposed in on-site impoundments/ponds; accidental and intentional off-site releases of wastes. |
| Contamination | - Soil, ground water, ponds, sediment, fish.<br>- Pesticides.<br>- VOCs including benzene and cadmium. |
| Clean-up Approach | (1) Soil and sediments: Excavate, consolidate on-site, stabilize with cement and fly ash, and cap with clay. (Completed 1994)<br>(2) Ground water: Construct ground water collection drain followed by either deep well injection or treatment with activated carbon prior to off-site discharge. (Treatment system built in 1994) |
| **10. Velsicol Chemical in Gratiot County, St. Louis, Michigan** | |
| Site | - Chemical and pesticide (DDT) manufacturing facility from 1936 until 1978 |
| Contamination | - On-site groundwater and sediments in the Pine River (bordering the site on three sides) are contaminated with DDT and other chlorinated compounds.<br>- Total DDT levels in the Pine River and the St. Louis Impoundment were extremely high and not decreasing over time (max. conc. = 32,000 ppm total DDT)<br>- Original estimate of total DDT plus metabolites to be remediated (Fields analysis): 538,730 lbs |
| Clean-up Approach | - 54 Acre site: containment system consisting of a slurry wall around the site and a clay cap (water level requirements included)<br>- In 1998 U.S. EPA signed an Action Memorandum for a time-critical removal action at the Site, including dredging/excavating sediments containing 3,000 ppm total DDT or greater (the hot spots), treatment of the sediments with a stabilizing/drying agent and disposal of the sediments off-Site.<br>- Estimated quantity of DDT plus metabolites removed through 1999: 430,000 lbs |
| **10. Myers Property, Franklin Township, New Jersey** | |
| Site | - Former pesticide and industrial chemical manufacturing facility.<br>- Site used intermittently by several companies from 1928 to 1959 to manufacture pesticides including DDT and industrial chemicals.<br>- Improper handling of the chemicals and wastes resulted in on-site contamination. |
| Contamination | - Soil, ground water, wetland, surface water, buildings, debris, drummed waste.<br>- Pesticides, including DDT.<br>- VOCs, Semi-volatile organic compounds (SVOCs), metals including arsenic, and dioxins. |
| Clean-up Approach | (1) Buildings: dismantle and remove five buildings and various surface debris. (Completed in 1998)<br>(2) Soils and sediments: Excavate and use a combination of low-temperature thermal treatment and chemical dechlorination for treating pesticides, dioxins, and other organics. Developing a plan to treat arsenic-containing soils because soil washing treatment was unsuccessful.<br>(3) Ground water: pump and treat system will be designed once the area of contamination is more fully defined. |
| **11. Diamond Alkali, Newark, New Jersey** | |
| Site | - Pesticide manufactured from 1951 to 1969; began production of DDT and phenoxy herbicides in mid-1940's.<br>- The way the site became contaminated is not specified. |

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|---|---|
| Contamination | - Soil, ground water, sediments, debris.<br>- Dioxin.<br>- Pesticides, including DDT.<br>- VOCs. |
| Clean-up Approach | (1) Immediate actions: property secured with a fence and guard service; cover exposed soils with geofabric; remove contaminated soil and debris from other properties and store on-site in shipping containers. (Completed)<br>(2) Interim remedy: construct a slurry wall and flood wall around the area; install a cap; pump and treat ground water to reduce migration of contamination. Treatment method was not specified.<br>(3) Long-term remedy: reevaluate remedy periodically; may modify to make more permanent and protective of human health and the environment. |
| **12. Drake Chemical, Lock Haven, Pennsylvania** | |
| Site | - From 1960's to 1981, manufactured chemical intermediates for pesticides and other organic chemicals.<br>- Site includes two lined wastewater treatment lagoons and two unlined lagoons.<br>- Chemical sludge and contaminated soils cover or underlay al of the open area on the site. |
| Contamination | - Soil, ground water, surface water, sediments, leachate stream.<br>- Fenac (herbicide).<br>- Organic compounds. |
| Clean-up Approach | - Leachate stream: reshape surface contours to manage water infiltration; seed area. (Completed in 1987)<br>- Buildings, lagoons and other structures: removal to an approved facility. (Completed in 1989)<br>- Soils and sediment: excavation and on-site incineration.<br>- Ground water: pump and treat. Treatment method not specified. |
| **13. Centre County Kepone Site (Ruetgers-Nease Corp), State College, Pennsylvania** | |
| Site | - Active chemical manufacturing plant.<br>- Produced Kepone (chlordecone) in 1958, 1959, and 1963 and Mirex (dodecachloropentacyclodecane) in 1973 and 1974.<br>- Process wastes were disposed on-site in a spray irrigation field, a concrete lagoon, and two earthen lagoons and were stored on-site in drums. Concrete lagoon leaked. |
| Contamination | - Soil, ground water, surface water, sediments, fish.<br>- Kepone and Mirex.<br>- Various VOCs. |
| Clean-up Approach | (1) Initial actions: excavate and remove contaminated material from lagoons, remove drums, excavate topsoil from the drum storage area, dispose of the material in a landfill.<br>(2) Long term remedy: extract and treat ground water (treatment method not specified); excavate soils and sediments and dispose off-site; surface water system improvements; monitor ground and surface water, sediments, and fish tissue; fencing. |

# APPENDIX D
# ADDITIONAL INFORMATION ON THE MINNESOTA PESTICIDE COLLECTION PROGRAM

## Summary of PBT Level 1 Pesticides Collected in Minnesota

Prepared by Nancy Fitz, USEPA, December 30, 1999

This document summarizes the data on the quantity of persistent, bioaccumulative and toxic (PBT) Level 1 pesticides collected at waste pesticide collection and disposal programs (a.k.a. "Clean Sweeps") in Minnesota from the late 1980's through 1998. The Level 1 PBT pesticides include aldrin, chlordane, DDT, dieldrin, mirex and toxaphene. This information was provided to the U.S. EPA Office of Pesticide Programs by Joe Spitzmueller of the Minnesota Department of Agriculture in May 1999.

Currently, Minnesota has the most comprehensive data in the U.S. on the quantities of specific pesticides collected by a state waste pesticide collection program. The Washington Department of Agriculture is compiling the historical data for its program, but this information is not available yet. Minnesota provided information on the quantity of 55 different pesticides collected per year from 1990 through 1998.[1] In addition, the amount of each pesticide collected before 1990 is also included. Tables 1 and 2 provide the information for the six Level 1 PBT pesticides.[2]

Table 1 provides the weight (in pounds) of each pesticide. DDT is the third most commonly collected pesticide in Minnesota and 52,653 pounds (over 26 tons) were collected through 1998. Chlordane (19,357 pounds) and toxaphene (15,519 pounds) are ranked 16 and 25, respectively. Aldrin (4195 pounds) and dieldrin (3142 pounds) were less common and are ranked 44 and 46, respectively. These data are presented in Figure 2. This figure shows that the amount of these pesticides – particularly DDT and chlordane – is increasing over time. While this is true, it's important to note that the total amount of pesticides collected each year in Minnesota is also increasing with time, as shown in Table 1 and Figure 1.

Therefore, it is also useful to consider the amount of each pesticide collected per year as represented by the percent of the total quantity of pesticides collected that year. This data provides a more accurate picture of the trends over time, since it is not dependent on the number of collection events held or the amount of money available to dispose of the pesticides. Table 2 provides the amount of each pesticide, in terms of the percent of the total amount of all pesticides, collected per year and overall. The overall percent is calculated using the total amount of that pesticide collected through 1998 and the total amount of all pesticides collected through 1998 (e.g., 52,653 pounds of DDT compared to 1,541,475 pounds of all pesticides). This data is presented in Figure 3. This figure shows that the amount of the Level 1 PBT pesticides – as a fraction of the total amount of pesticides collected – are generally decreasing over time.

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[1] If you would like the data on all 55 pesticides, please contact Nancy Fitz at 703-305-7385 or fitz.nancy@epa.gov.

[2] No data were reported for mirex.

Chlordane is a slight exception, since it shows a gradual increase over the past few years. Despite chlordane's upward trend from 1995 through 1998, however, only the 1998 value is greater than the overall percent.

**Table 1: Amount of PBT Level 1 Pesticides (Pounds) Collected in Minnesota [1]**

| Rank | Pesticide | <1990 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | DDT | 808 | 3,648 | 2,715 | 6,159 | 5,668 | 4,305 | 3,172 | 6,335 | 11,681 | 8,162 | 52,653 |
| 16 | chlordane | 888 | 614 | 260 | 562 | 1,686 | 6,422 | 1,055 | 1,073 | 2,241 | 4,556 | 19,357 |
| 25 | toxaphene | 1,005 | 1,886 | 190 | 2,216 | 2,105 | 3,490 | 900 | 1,332 | 1,395 | 1,000 | 15,519 |
| 44 | aldrin | 191 | 31 | 370 | 15 | 1,600 | 91 | 899 | 66 | 633 | 299 | 4,195 |
| 46 | dieldrin | 9 | 242 | 47 | 63 | 352 | 1,154 | 610 | 42 | 268 | 355 | 3,142 |
| | | | | | | | | | | | | |
| | All pesticides | 32,396 | 34,098 | 35,751 | 53,843 | 135,104 | 183,568 | 237,261 | 208,220 | 308,701 | 312,533 | 1,541,475 |

Note: (1) No data were reported for mirex.

**Table 2: Amount of PBT Level 1 Pesticides (Percent of Total) Collected in Minnesota [1]**

| Rank | Pesticide | <1990 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | Total | Max | Min | Med |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | DDT | 2.49 | 10.70 | 7.59 | 11.44 | 4.20 | 2.35 | 1.34 | 3.04 | 3.78 | 2.61 | 3.42 | 11.44 | 1.34 | 3.41 |
| 16 | chlordane | 2.74 | 1.80 | 0.73 | 1.04 | 1.25 | 3.50 | 0.44 | 0.52 | 0.73 | 1.46 | 1.26 | 3.50 | 0.44 | 1.15 |
| 25 | toxaphene | 3.10 | 5.53 | 0.53 | 4.12 | 1.56 | 1.90 | 0.38 | 0.64 | 0.45 | 0.32 | 1.01 | 5.53 | 0.32 | 1.10 |
| 44 | aldrin | 0.59 | 0.09 | 1.03 | 0.03 | 1.18 | 0.05 | 0.38 | 0.03 | 0.21 | 0.10 | 0.27 | 1.18 | 0.03 | 0.15 |
| 46 | dieldrin | 0.03 | 0.71 | 0.13 | 0.12 | 0.26 | 0.63 | 0.26 | 0.02 | 0.09 | 0.11 | 0.20 | 0.71 | 0.02 | 0.12 |

Note: (1) No data were reported for mirex.

**Figure 1: Amount of All Pesticides Collected (Pounds) per Year in Minnesota**

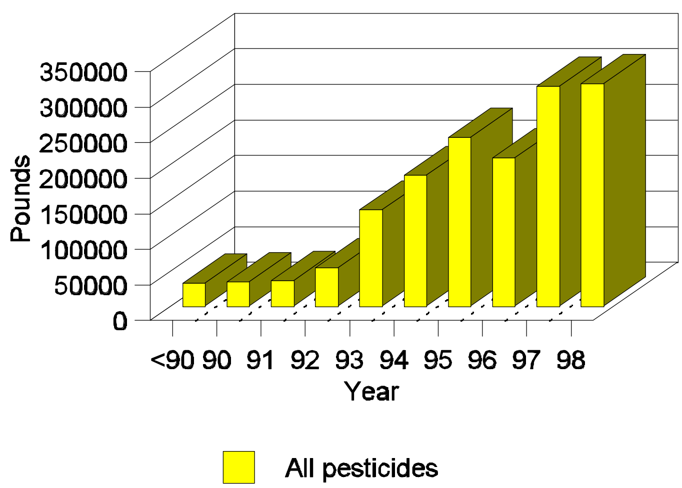


**Figure 2. Amount of PBT Pesticides Collected (Pounds per Year in Minnesota**

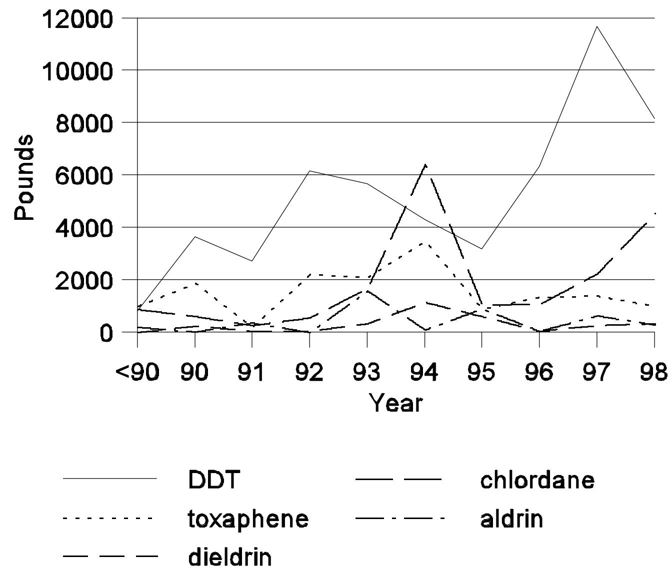
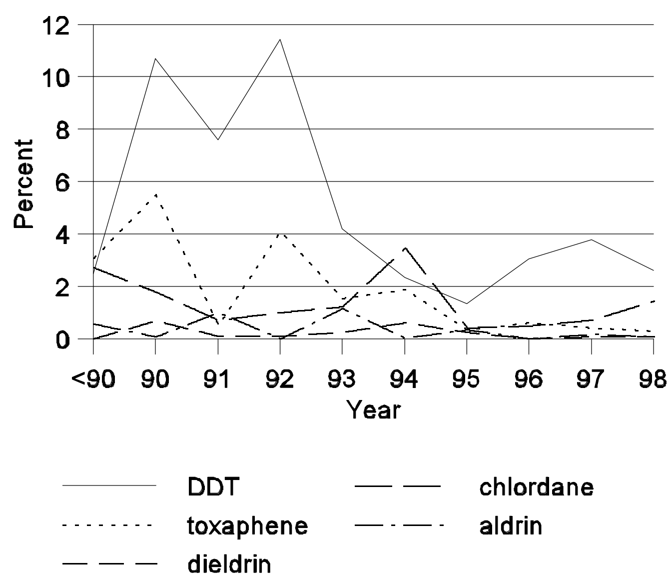



**Figure 3. Amount of PBT Pesticides Collected (Percent of Total) per Year in Minnesota**



# APPENDIX E
# RELEVANT GPRA GOALS

GPRA objectives in EPA's 1997 Five Year Strategic Plan are currently in the process of being revised in the Draft 2000 Strategic Plan; therefore, some of the goals relevant to the Level 1 pesticides listed below may change. Revised objectives in the Draft 2000 Strategic Plan are now undergoing external review separate for this Draft PBT Action Plan for the Level 1 pesticides.

Goal 2: Clean and Safe Water

- By 2005, protect human health so that 95% of the population served by community water systems will receive water that meets drinking water standards, consumption of contaminated fish and shellfish will be reduced, and exposure to microbial and other forms of contamination in waters used for recreation will be reduced;

Goal 4: Preventing Pollution and Reducing Risk

- By 2005, public and ecosystem risk from pesticides will be reduced through migration to lower-risk pesticides and pest management practices, improving education and at-risk workers, and forming "pesticide environmental stewardship" partnerships with pesticide user groups:

  - By 2005, human exposure to pesticide use will be reduced, including reducing (by 50% from 1995 levels) the number of workers suffering adverse health effects caused by acute pesticide poisoning; reducing (by 50% from 1995 levels) consumer and commercial use of pesticides with significant neurotoxic effects; providing all pesticide handlers, farm workers and applicators using pesticides adequate training in the safe handling, use and *disposal of pesticides [emphasis added]*; and reducing use (by 50% from 1995 levels) in the U.S. of pesticides with high potential to leach into and persist in groundwater. *[Note: While this goal and sub-objective deal with pesticides that are currently registered and used (unlike the Level 1 pesticides), the goal and sub-objective are included here because they include the GPRA connection to pesticide disposal. Because one of the actions of this plan is to support waste pesticide collection and disposal programs, this GPRA connection to pesticide disposal is included.]*

Goal 5: Better Waste Management and Restoration of Contaminated Waste Sites

- By 2005, EPA and its partners will reduce or control the risk to human health and the environment at over 375,000 contaminated Superfund, RCRA, UST and brownfield sites.

- By 2005, over 282,000 facilities will be managed according to the practices that prevent releases to the environment, and EPA and its partners will have the capabilities to successfully respond to all known emergencies to reduce the risk to human health and the environment.

- By 2005, 90% of existing hazardous waste management facilities will have approved controls in place to prevent dangerous releases to air, soil, and groundwater (compared to the universe baseline from 1996).

- By 2005, reduce hazardous waste combustion facility emissions of dioxins and furans by 90%, particulate matter by 50% and acid rain gases by 50% from levels emitted in 1994.

Goal 6: Reduction of Global and Cross-Border Environmental Risks

- By 2005, consistent with international obligations, the need for upward harmonization of regulatory systems, and expansion of toxics release reporting, reduce the risks to U.S. human health and ecosystems from selected toxics (including pesticides) that circulate in the environment at global and regional scales;

Goal 7: Expansion of Americans' Right to Know About their Environment

- By 2005, EPA will improve the ability of the public to reduce exposure to specific environmental and human health risks by making current, accurate substance-specific information widely and easily accessible.

    - By 2005, pesticide, TSCA, water and other environmental information and *tools* will be available to all communities and citizens, through the Internet, outreach efforts, and consumer confidence reports, to help them make informed choices about their local environment, including where to live and work, and what potential exposures are acceptable; and to assess the general environmental health of themselves and their families.

Goal 8: Sound Science, and Greater Innovation to Address Environmental Problems

- Incorporate innovative approaches to environmental management into EPA programs, so that EPA and external partners achieve greater and more cost-effective public health and environmental protection;

Goal 9: A Credible Deterrent to Pollution and Greater Compliance with the Law

- Promote the regulated communities' voluntary compliance with environmental requirements through compliance incentives and assistance programs.